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OIL WEEKLY

OCTOBER, 1956

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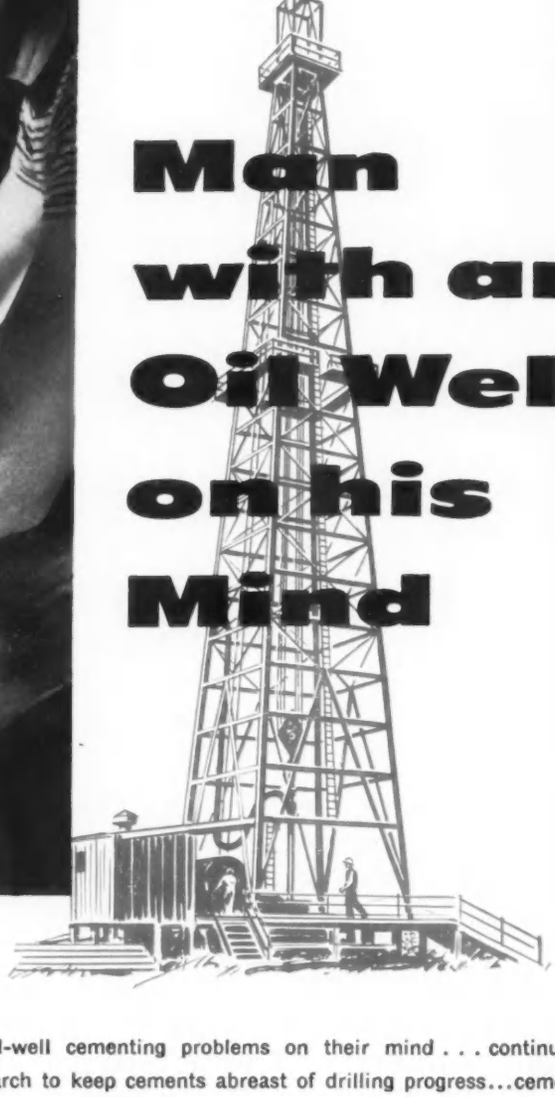

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WORLD OIL

Established 1916 as The OIL WEEKLY®

a quick look at WORLD OIL this month

BUSY OIL MEN: To help you put first things first, scan these time-saving digests on this and the following pages, checking ☑ those you want to read first.

☐ **Serious market troubles** face the U. S. oil industry, according to this month's report from the Observatory. Turn to **Pages 130 and 131** for two of WORLD OIL's popular features—the *Observatory* and *Petroleum Trends in U. S.*—now combined in convenient form for quick-look reading. You'll find an analytical view of what's ahead, plus U. S. trends in graphical form and tabular breakdowns of crude oil and refined products trends and production by states.

CURRENT OUTLOOK

☐ **Supplies of steel products** for the oil and gas industries are due to remain scarce. But some increases will be provided in each of the next several years. Steel companies have programs for increasing the capacity of existing pipe mills. They also are building several new pipe mills. To feed the new and enlarged mills with raw material, steel companies are providing additional ingot capacity. Some operators will not be able to get all the steel they want during the next several years. But there should be no critical shortages. And over the long term, the needs of the oil and gas industries will be met. Turn to **Page 102. Steel Supplies to Increase Gradually. Henry J. Wallace**

Turn the Page ▸

Drilling Progress Articles

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☐ **The contractor gives a frank opinion of his industry.** From more than 300 questionnaires and numerous meetings with contractors has come a frank appraisal of the industry. Here are some of the biggest woes that beset the contractor and some of the possible measures that could be taken to alleviate this situation. Turn to **Page 155** for . . . **A Look at the Drilling Contract Industry**.....**John N. Schuelke**

☐ **The major direct costs of drilling** are recognized widely and controlled wisely . . . but the emphasis is now being placed on the determination of indirect and related expenses. Turn to **Page 160** and read how management must increase its efficiency by whittling away at the remaining vulnerable costs. **Fringe Costs Must Be Considered**.....**W. K. Powell**

☐ **What about insurance?** Insurance companies are organized to assume recurring risks. They will insure against many of the losses commonly associated with a drilling venture. These are costs that must be passed on in the bid. Turn to **Page 165** and see what types of insurance are available and under what conditions. **Are Your Risks Insured?**.....**George I. Terrel**

☐ **Modern drilling rigs have about reached their peak** for fast drilling time, but cost savings can still be effected by trimming the rig weight and reducing transportation costs. On **Page 168** are some ideas on how to . . . **Streamline Your Rig and Save Money**.....**G. C. MacDonald**

CURRENT OUTLOOK *continued*

☐ **Lovington, situated** in the arid ranching flat lands of New Mexico, was started on its way by a celebration over a boat floating on real water. Unique? Yes, just as unique is the Denton oil pool nine miles northeast, which is said to be one of the Permian Basin's most prolific pools. See **Page 105. Oil Boom on the Flat Plains**.....**Carl I. Huss**

☐ **The discovery well of the fabulous Cushing field** in Oklahoma is flowing again. After a rework job, the well that started the book back in 1912 came in flowing 648 barrels of 38 gravity oil per day. Oklahoma operators are especially gratified by the revival. See **Page 108. Old Faithful Flows Again.**
Anthony Gibbon

☐ **A late 1955 gas-distillate discovery in western New York** state has focused attention of Appalachian operators on this area. Four gas wells have been completed so far in an area that had been long neglected as to Oriskany possibilities. The gas contains significant amounts of distillate, unlike most Oriskany gas found previously. Other unusual aspects concern the land and legal problems in the Allegany State Park area and the Seneca Indian Nation. **Page 110. New York Discovery Being Developed**.....**H. T. Brundage**

☐ **The U. S. lags behind Russia** in the number of its engineers. Concrete suggestions whereby more students may be attracted to the engineering profession —and ways in which industry can help to meet this demand are set forth in the thought-provoking article on **Page 112. More and Better Engineers Needed.**
John M. Campbell

☐ **No business can operate** in a communications vacuum—particularly the dynamic oil industry. For a comprehensive analysis of the vital role communications plays in employe relations, plus a detailed discussion of good and bad communications approaches, turn to **Page 114. What's Wrong With Company Communications?** .....**Dr. Alan A. McLean**

☐ **Interviews are the most used**—and mis-used personnel tools in the oil industry. For a timely analysis of the most common faults in modern interviewing methods, plus many excellent ways to improve interviewing skills, turn to **Page 120. How to Conduct a Successful Interview.** .....**Dr. Harold A. Edgerton**

WORLD OIL, published every month except semi-monthly in February and August. Entered as THE OIL WEEKLY as second class mail matter December 23, 1916, at post office at Houston, Texas, under the act of March 3, 1879.

in this issue . . .

☐ **A Banker speaks out.** The terms imposed upon the drilling contractor are not much different from those required of other industries. To see why a bank sets forth certain conditions, turn to **Page 179** and read . . . **Will the Banks Finance the Contractor?**. . . . **Harold Vance**

☐ **How one company uses engineers.** Can the contractor afford the services of an engineer in this day of increasing technology? One company with a well organized engineering department uses engineers to develop drilling practices, design maintenance programs and give assistance on complicated bids. For further information on how this department is organized and how new engineers are trained, read . . . **Can Engineers Help the Contractor?**. . . . . **Page 182**

☐ **In this day of specialists** it is difficult for the producer to be fully aware of the trials and tribulations of other specialists such as the drilling contractor. The article on **Page 186** points out, however, that a better understanding of the contractor's business would pin-point a few instances where . . . **The Operator can Help the Drilling Contractor**. . . . . **Morris McDannald**

☐ **What does a contract mean?** Contracts entered into in good faith should obligate both parties to cooperation and understanding beyond the written word of the contract. Some of the duties and obligations of both parties are pointed out in the article beginning on **Page 195. An Operator Looks at the Contract**. . . . . **S. C. Oliphant**

☐ **Here's how Gulf Oil Corporation** goes about planning a wildcat by seeking:

- The cooperation of all departments in the review of all pertinent information.
- The establishment of a definite but flexible procedure.
- The delegation of authority and responsibility.

Turn to **Page 196. Minutes are Money—Plan Your Well** . . . . . **H. L. Strider**

☐ **The Elk City field in Oklahoma can serve as a model** for the orderly and well planned development program that will benefit operator and contractors alike. To see how Shell Oil Company's advance planning and consideration of the contractor has paid off, read . . . **Cooperation and Planning Can Mean Profit for Everyone**. . . . . **Page 210**

☐ **Coming events** have been said to cast their shadows before them. This applies to future oil and gas legislation. What to expect on oil and gas matters in the 85th Congress, beginning next January, will be foreshadowed by results of the general election November 6. In so far as incumbent office holders are returned to office, Washington action on oil and gas matters can be foreseen in the record of past legislation. But future trends will depend greatly on choice of a President and the extent to which new members appear in Congress. Read Changing Panorama on **Page 120. Election Will Forecast Oil and Gas Legislation**. . . . **Don E. Lambert**

EXPLORATION ARTICLES

☐ **Metric sieves were one of the first tools used in geological research.** First models were manually operated and, although they performed their assigned job with certain satisfactory results, further refinements in the form of vibrators and gyrating devices have enhanced the scientific value of the instrument. The article beginning on **Page 137** points to the advantages offered by the gyrating vibrating screens in complex research projects. **Gyratory Sieving Speeds Research** . . . . . **Dr. Robert H. Cummings**

☐ **What is the status of exploratory activity in Oregon?** Where are the areas that show certain promise from geologic investigations? And why do drilling conditions vary so greatly from region to region in this area? For the answers to these questions, turn to **Page 140** and read . . . **Sedimentary Basins in Oregon**. . . . . **R. E. Corcoran**

☐ **A combination of geologic interest and monetary return** has led the U. S. Gulf Coast to become the most highly developed salt dome region in the world. This, plus a complete roundup of world salt dome basins is discussed in the article starting on **Page 143. Salt Dome Interest Centers on U. S. Gulf Coast** . . . . . **Dr. J. Brian Eby**

PRODUCTION ARTICLES

☐ **Dry land operations of the Cumberland oil field** near Madill, Okla., are maintained by an ingenious application of good engineering practices. The system is described in detail in the article beginning on **Page 227.** The technique as worked out by The Pure Oil Company is applicable in areas where similar conditions may be encountered. **A Modern Ark Thwarts the Floods**. . . . . **W. M. Saxon and J. R. Weyler**

Turn the Page ▸

THIS MONTH . . .

☐ **Pressure maintenance vs. secondary recovery** . . . this question constantly confronts the production man. The Golden Spike pool is an excellent example of a successful maintenance program that will influence similar problems in Western Canada. Turn to **Page 232. Pressure Maintenance in the Golden Spike Pool**.....**D. J. McEachern**

☐ **Paraffin formation has long been a problem with production men.** But now new chemicals and improved methods are solving the problem—safely, economically and effectively. Turn to **Page 236** for the latest information on paraffin control methods. **Why Not Dissolve Your Paraffin Problem**. .**Buford Cranford**

☐ **Of what value is the study of a fracture** prior to initiating a cycling project? The answer is aptly presented in this analysis of simple vertical fractures in a distillate reservoir. It includes data on areas swept, the quantity of wet gas produced at various intervals, a comparison with unfractured wells, and other interesting information. See **Page 245. How Vertical Fractures Affect Cycling Program**.....**Paul B. Crawford, Baxter Honeycutt, James Sanderlin and Henry Ince**

☐ **Use of a high pressure gas injection process to recover oil from deep reservoirs** has definite merit, according to one company's findings. What it is . . . how it works . . . advantages and limitations . . . and some reservoir qualifications for its use are discussed in the article on **Page 260. High Pressure Gas Injection Is a Success**.....**H. A. Koch, Jr.**

☐ **Interesting questions . . . and expert answers.** Here are the questions on water-flood activities as asked by Mid-Continent operators and the answers supplied by some experts on the problem. Turn to **Page 264. How Do You Solve Your Water-Flood Problems?** .....**Anthony Gibbon**

INTERNATIONAL ARTICLES

☐ **Since Caltex discovered oil in the Minas field of Sumatra** in 1939, daily crude production has risen to a current 65,000 barrels per day. But in achieving this record, the company met and had to solve many of the operational problems common to activity abroad. **Problem-Ridden Minas Field Now Producing 65,000 BPD**.....**Page 273**

☐ **Interested in how oil people live** in other parts of the world? WORLD OIL's Camp City Profiles are designed to meet that interest. On **Page 274** is an article—well illustrated with pictures—describing how oil folks live in Barranquilla, Colombia, and how they like it. **Life in Barranquilla . . . Cultured and Conservative** ..... **James Joseph**

NEXT MONTH . . .

A Special Report on Exploration Techniques

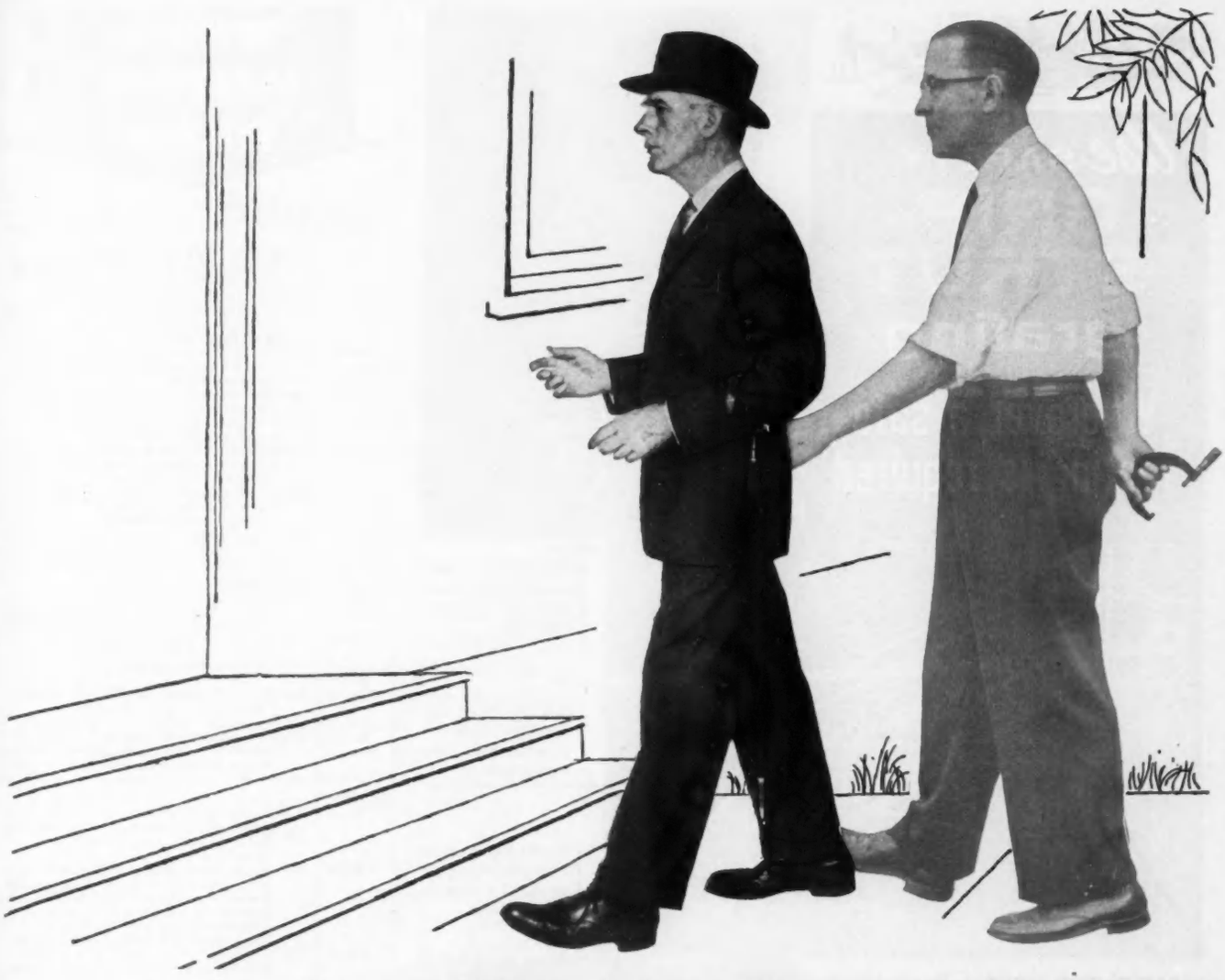
WORLD OIL's big November issue will contain a Special Report on exploration techniques. This report is tailored to show you the significance of recent developments in exploratory methods.

For instance, here's just part of the valuable information you'll find:

- **The potential of the Hainesville Dome** . . . written by a top authority who says this Dome is a second Van field . . . and gives you his reasons why. He shows you the stratigraphic pattern of the entire area . . . and points to three possible oil pools (invariable). You get predictions—within 2 to 5 percent—of what well depths will be. Fault angles are indicated in degrees. And mind you . . . this dome is still in the exploratory stage!
- **Surface alteration studies as a structural mapping tool** . . . shows you how alteration has occurred in surface sediments. Explores relation of surface mineralization to earth temperatures . . . with conclusions as to what surface alteration represents. You have a complete description of the application of surface alteration as a structural mapping tool . . . plus a case history of an experimental project.
- **New techniques and areas of interest in mineral oil prospecting** . . . deals with marine areas which have been the site of marine sedimentation throughout the tertiary. Explains latest improvements in marine geophysical methods. You have a comprehensive description of offshore seismic methods . . . with factors which influence these methods.

After you've seen it, you'll agree that this Special Report on Exploration contains information that is revolutionary. And remember . . . each issue of World Oil has a complete and separate section devoted exclusively to exploration methods and practices. You don't waste time hunting for the information you need. World Oil puts it on one place . . . saves you time and effort.

So, make a note to be on the lookout for your November Issue of WORLD OIL containing the Special Report on Exploration.



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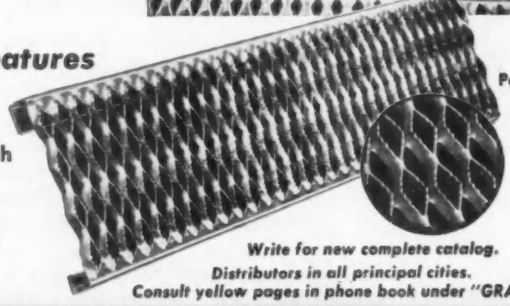

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WHO'S MEETING WHERE

OCT.	
2– 3	Texas Mid-Continent Oil & Gas Association, 37th Annual Meeting, Rice Hotel, Houston, Texas.
7– 9	American Association of Oil Well Drilling Contractors, 16th Annual Meeting, Texas Hotel, Fort Worth, Texas.
14–17	AIME, Petroleum Branch Fall Meeting, Biltmore Hotel, Los Angeles.
14–20	Oil Progress Week.
15–16	National Association of Corrosion Engineers Western Region, Fall Meeting, Lafayette Hotel, Long Beach, Calif.
18–21	Permian Basin Oil Show, Ector County Coliseum and Fair Park area, Odessa, Texas.
22–24	Rocky Mountain Oil & Gas Association, Annual Convention, Cosmopolitan Hotel, Denver.
22–26	National Safety Congress and Exposition, Conrad Hilton, Congress, Morrison and La Salle Hotels, Chicago.
23–26	National Association of Corrosion Engineers, South Central Region, Gunter Hotel, San Antonio, Texas.
29–30	Independent Petroleum Assn. of America, Annual Meeting, Statler-Hilton Hotel, Dallas.
29–Nov. 1	Society of Exploration Geophysicists, National Convention, New Orleans.
31 to Nov. 2	Gulf Coast Association of Geological Societies, 6th Annual Convention, Plaza Hotel, San Antonio, Texas.
NOV.	
8– 9	American Association of Oilwell Drilling Contractors, 11th Annual Safety Clinic, Statler-Hilton Hotel, Dallas.
8– 9	American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Section, Ambassador Hotel, Los Angeles.
12–15	API, 36th Annual Meeting, Conrad Hilton and Palmer House Hotels, Chicago.
19–20	AIME, North Texas Section, Symposium on Secondary Recovery, Municipal Auditorium, Wichita Falls, Texas.
25–30	American Society of Mechanical Engineers, Statler Hotel, New York.
29–Dec. 15	Indian Industries Fair, New Delhi.
DEC.	
3– 4	New Mexico Oil & Gas Association, Annual Meeting, Alvarado Hotel, Albuquerque, New Mexico.
6– 8	Interstate Oil Compact Commission, Annual Meeting, Wichita, Kansas.
16–18	Kansas Independent Oil & Gas Association, Annual Meeting, Broadview Hotel, Wichita, Kansas.
1957.	
APRIL	
6–11	Petroleum Equipment Suppliers Association, Palm Springs, Calif.

Nomads' Chapter monthly meeting: Los Angeles, second Wednesday, Jonathan Club, Wallace A. Sawdon, Secretary. Houston, second Monday, Ye Old College Inn, Harry E. Estes, Secretary. Dallas-Fort Worth, first Monday, Greater Dallas Club, Hank Davis, Secretary. Tulsa, Hotel Tulsa, Gilbert Swift, Secretary. New York, first Monday, Hotel Biltmore, Jesse E. Hickman, Secretary.

Looking Ahead . . .

. . . **Much uncertainty confronted the whole world petroleum industry in late September.** There was a threat of shortage of oil in Western Europe and scarcity in the U. S. after non-Egyptian pilots quit their Suez Canal jobs. This outlook contrasted sharply with that of a few weeks earlier, before the Suez seizure, when oversupply plagued the world oil markets.

•

. . . **U. S. crude producers have been condemning high imports.** They now abruptly face the possibility of being called upon to boost their production sharply. It was proposed that if the movement of Middle East oils to Europe should be seriously interrupted, the U. S., Venezuela, and other Western Hemisphere sources might be called upon to supply Europe's deficit. State representatives indicated to the U. S. government that U. S. crude production could be increased as much as 1.1 million barrels daily if necessary.

•

. . . **In the U. S. steps were taken in late September,** nevertheless, to remedy the U. S. oil oversupply situation. A number of major refining companies announced curtailment of crude runs to stills to help alleviate the growing surplus of gasoline. A majority of Texas crude purchasers indicated lower requirements of crude for October. The Texas Railroad Commission consequently reduced allowable crude production in the No. 1 producing state for the month. It fixed the allowable at 3,279,697 barrels daily, a cut of 75,160 barrels from mid-September. The schedule allows 15 producing days during October's 31 days.

•

. . . **Tanker rates have increased considerably all over the world** as a direct result of the Suez Canal dispute and its possible future consequences. Tankers for the Lebanon-U. K. haul were recently fixed at Scale plus 140 percent and from the Persian Gulf to Lisbon at Scale plus 180 percent. Tankers in the Caribbean to the U. K. were commonly fixed at U. S. M. C. plus 100 percent. Stanvac fixed one 17,000-ton tanker for the Caribbean-Australia run at Scale plus 100 percent.

•

. . . **The Suez Canal seizure has been a jarring shock to investors' confidence** in the stability and growth of oil companies, particularly the great internationals, stated Arnold Bernhard & Company, New York investment advisers, in "Value Line Investment Survey" of August 20. "The heritage of the canal crisis may be a rush of nationalistic acts by other Arab countries that nibble away at the security and profitability of oil investments elsewhere in the Middle East," said the report. "The reopening of investors' minds to the presence of risk, to the fact that future growth seems more subject to interruption, may lead to a less liberal capitalization of oil company earnings and lower prices for oil stocks, even as the earnings themselves continue to rise." At least in late August and September the analysis was affirmed, as prices of oil stocks declined.

•

. . . **The technique of drilling in deep water from a floating barge is progressing rapidly.** It apparently will permit the drilling of many deep water areas off the California coast. In fact, the deeper the water, the easier it may be to drill. Wave action at the surface will cause relatively slight lateral movement of the drill string on the ocean floor. Some 8000 feet offshore from Coal Oil Point, Santa Barbara County, a major oil company in the latter part of August drilled a test hole in 220 feet of water to a depth "in excess of 6000 feet." Using 2⅞ drill string, the operator furthermore actually produced the well a short while from a thick oil sand, establishing a highly significant discovery.

•

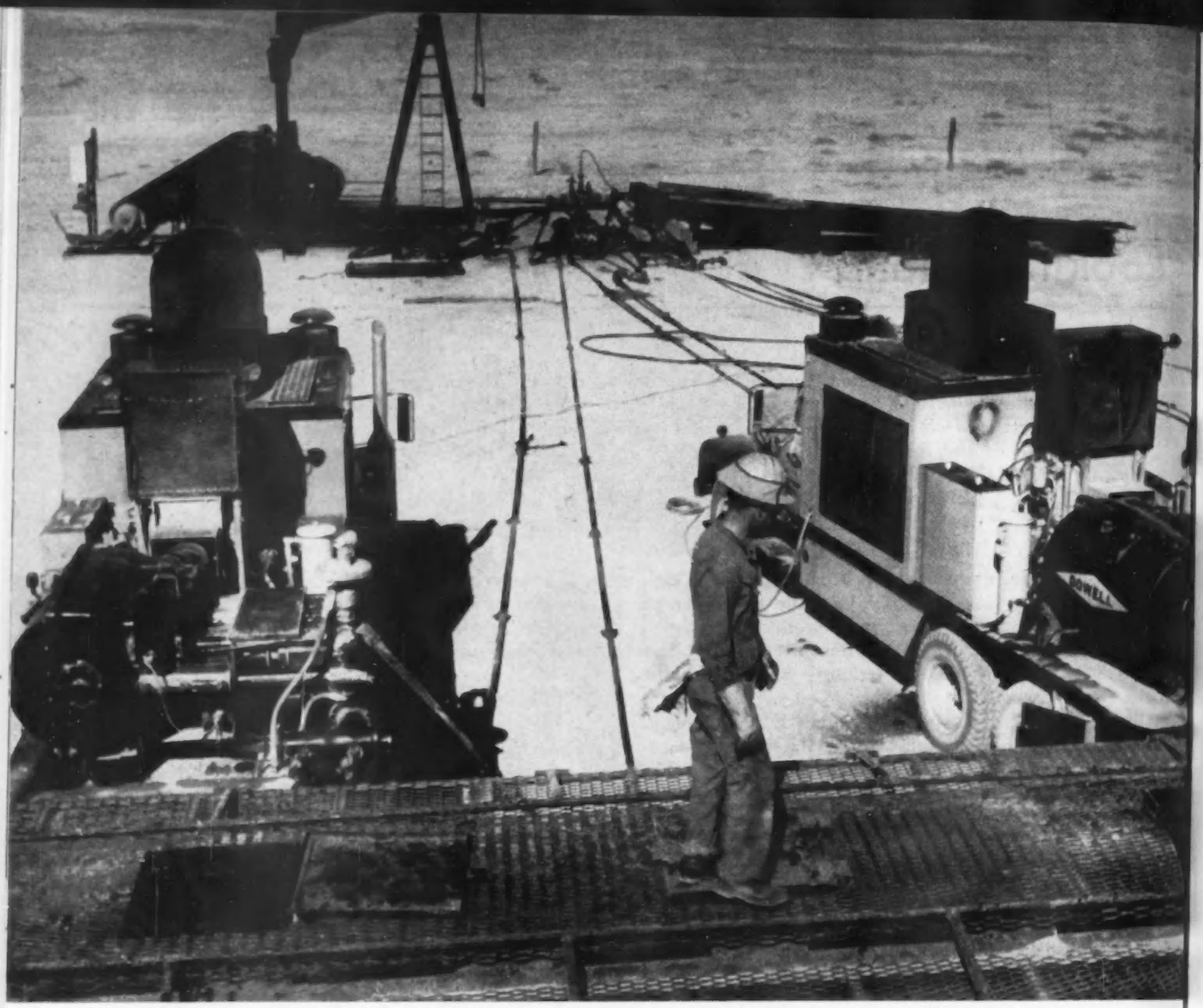
. . . **Of every $5 oil companies have invested offshore, $4 is unrecovered.** Through 1955 they had invested $1¼ billion and recovered $¼ billion.

•

. . . **Further vast sums must be spent to continue offshore oil development.** One well recently abandoned as a dry hole alone cost $1 million. It would have cost $1½ million if completed as a producer. A joint test of Shell and Continental and farthest offshore so far, it was drilled to 13,386 feet in 93 feet of water 63 miles off Galveston. Drilled by "Mr. Gus," mobile drilling platform, it was on a 103,680 acre block leased from U. S. for bonus of $5.5 million. The $1 million cost of the dry hole did not include lease or pre-drilling costs, such as the $2000 daily for some time for seismic work and $30,000 for surveying, soil boring, and staking of location by electronic methods.

•

. . . **Here are the odds in wildcatting** based on 20,478 new field wildcats drilled in 17 states in the 5 years 1945-1949 and determined by Dr. Frederic H. Lahee, Dallas consulting geologist: one in 11.9 discovered oil or gas, one in 14.1 discovered oil, one in 42 discovered an oil field with as much as 1 million barrels of ultimate recoverable reserves, one in 158 discovered 10 million barrels or more of reserves, one in 427 found 25 million or more barrels, and one in 706 discovered 50 million barrels or more.



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Oct

U. S. Tax Burden Can Be Cut

Too large a share of the money earned by Americans has become a fleeting thing that flows swiftly through our fingers on its way to the tax coffers of the federal government and 48 state governments.

Few Americans realize how much of their income goes to pay government taxes. This is because there are so many hidden taxes.

If you don't believe it, look at this one example: With the new hike in gasoline taxes, the average U. S. car owner will pay an annual state and federal gasoline tax of nearly $70. More of these startling statistics reveal that the 48 states have collected over $26 billion in gasoline taxes during the last 25 years, and that state and federal gasoline taxes have nearly tripled in the last 10 years, rising from $1½ billion to more than $4 billion annually.

This is but one tax example. There are taxes on alcohol, cigarettes, automobiles, tires and thousands and thousands of other items. These are hidden taxes, paid in purchase prices. Finally, individuals pay income taxes and corporations pay taxes on profits. In all, taxes take over 30 percent of the total national income.

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Every American must now work one day out of every four to support federal and state governments. In 1929, one day's work out of ten went for government support.

In spite of tremendous technological advances bringing amazing gains in productivity, the average American today must work two times as many hours to pay his taxes as he did 27 years ago. If this rate of increase is permitted to continue, each American will have to work 1000 hours every year just to pay his taxes in 1983.

Obviously, long before this occurs our economy will collapse. The individual citizen could not possibly work enough hours to support both the government and his family.

There is another extremely important consideration. The phenomenal productivity of the U. S. is based upon large-scale investment capital. There must be sufficient investment capital available for new enterprises and for expansion of old concerns to keep the American business system alive. This is the way jobs are made. Huge productivity is made possible by providing an average of $12,000 worth of equipment per person, and spending more than $400 a year per worker for maintenance of this equipment.

It is impossible to get sufficient investment capital with a tax system that takes most of the surplus above actual living costs. By leaving too little for investment, such a tax program undermines the very foundation of the American economic system that has given the U. S. abundance in peace and might in war—and on which the future of the nation depends.

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Fortunately, something can be done immediately about federal government expenditures, which amounted to $66 billion last year.

The solution: Adoption of the Hoover Commission proposals for eliminating waste and inefficiency. This could cut federal government costs by $5½ billion or more annually. Since federal income taxes alone take over $30 billion from our earnings annually, this saving could result in a 15 percent federal tax decrease for the 66 million U. S. workers.

This is not only worth thinking about—it is worth doing something about.

Now is a very opportune time to take action. It is a national election year. Write all candidates for the Senate and House of Representatives that you want wasteful federal government spending stopped, and ask them to pledge action.

Time is important. Every minute's delay in putting the Hoover proposals in effect means the waste of $10,500 per minute. Every hour costs $630,000, and every day costs $15,120,000.

Warren L. Baker

U. S. Steel Vice President Henry J. Wallace tells Alabama-Mississippi Division, Mid-Continent Oil and Gas Association in Mobile, Ala. . . .

Steel Supplies in U. S. To Increase Gradually

• Pipe and oil country tubular goods will remain scarce but not critically short. Some operators may not get all they want.

• Some increase in supply of both line pipe and oil country goods will occur in each of the next several years.

• Steel companies are expanding capacity of existing pipe mills and building several new pipe mills, while boosting ingot capacity for different end products.

By HENRY J. WALLACE, Vice President, National Tube Division, U. S. Steel Corporation, Pittsburgh, Penn.

ALTHOUGH THE recent strike caused a loss of needed production of steel and accentuated scarcities, the outlook for supplies of steel for the oil and gas industries is hopeful. Some increase in supply of both line pipe and oil country goods is assured over each of the next several years. Projected expansion programs of steel companies will provide those increases. For the long pull, it appears very certain that the needs of the oil and gas industries will be met.

The steel industry must depend on newly built facilities to get significantly more tubular products. Consequently, there is little prospect of *large* increase in the supply of these products over the next few years. Pipe and oil country tubular goods will not be in free supply in the immediate or near future. That does not necessarily mean critical over-all shortages. The situation can, however, handicap the very rapid expansion of an individual operation. The situation also probably means that individual operators may not be able to accumulate what they consider to be comfortable steel inventories.

The promise of a gradual increase in the supply of steel for the oil and gas industries is given in the expansion plans of many steel companies. They will provide new ingot capacity for many different end products, including tubular goods and other items for the oil and gas industries. Some of the steel concerns have programs for increasing production of tubular goods at their existing pipe mills, and several have new pipe mills under construction, supported by additional steel making facilities.

Competition a Factor. Any discussion of future steel availability involves estimates of future steel plant construction. In this connection, there is one very marked similarity between the oil industry and the steel industry. Both are highly competitive within themselves. Each industry is composed of many large and small corporations and individuals competing with each other in various phases of its activities. Each capital expenditure in the steel industry, just as in the oil industry, is made by a private concern, and each such expenditure is made only after the probability of continuing profits has been established.

An integrated steel plant represents not only a very large capital investment, but also a very fixed one. It is fixed geographically in the sense that it cannot be moved, and also fixed with respect to the type of end product. The market for the product of

'The oil and gas industry receives directly from steel mills and distributors 7 percent of the total steel produced in this country.'

any new still mill must be presumed to exist for many years into the future. New integrated steel plants are not and cannot be built based on short term upward surges in requirements for those products, except as such upward surges in demand confirm the probability of a long range, fairly constant market for the product. Companies in the steel business compete with each other in supplying such markets as they can see them or simulate them, and each investment in new facilities is a competitive move, just as is the case in the oil business.

The oil and gas industry receives directly from steel mills and mill distributors 7 percent of the total steel produced in this country. This figure does not include the steel required in many forms for the machinery, equipment, and containers used by oil and gas companies. Almost all the equipment used for finding, producing, transporting, refining, and distributing oil and gas is made of steel. Wire and wire lines are essential to petroleum producing operations. Tankage takes large quantities of plate. Structural shapes are required for many offshore drilling platforms. But the principal form in which oil and gas companies consume steel is tubular. They use every type of steel tubular product from buttweld standard to stainless cracking still tubes. With the exception of a relatively small tonnage used in conveying water and solids, such as coal, suspended in water, all line pipe production is used for collecting, transporting, or distributing oil and gas. Casing, tubing, and drill pipe—collectively called oil country tubular goods—are used almost exclusively for the production of oil and gas.

During the postwar decade, overall steel production has increased 48 percent. American steel companies have invested some 7.1 billion in facilities. Demand for steel has come from all types of steel consumers, and the expansion of the industry has been fairly well balanced with respect to end products. Tubular products have had more than their share of attention. Such products represent 12 to 13 percent of current steel shipments; ten years ago they represented only 10 percent.

Drilling Growth. Few people recognize the rate at which oil and gas well drilling and the production of steel for that purpose have increased during this decade. Consumption of petroleum products in the U. S. has increased 73 percent to 8,415,000 barrels per day. But the number of wells drilled has increased 109 percent since 1945. This year, in spite of the steel strike, there again will be a new record of some 57,000 wells drilled. The footage drilled has increased even more significantly, by 145 percent to 227,500,000 feet in 1955. While overall steel production has increased 48 percent shipments of oil country tubular products went up 127 percent from 1,117,800 tons in 1945 to 2,542,000 tons in 1955. No other major steel mill product has shown such a rate of increase in production in the past ten-year period.

Quite apart from the increase in the number of tons of oil country goods, but equally impressive, has been the increase in physical properties over the past ten years. The higher grades of casing required for deeper wells generally are made by heat treating or warm working casing made from steels normal to the lower grades. These operations are performed on specialized supplementary finishing equipment. The investment in such equipment has been substantial and regular. It has not produced additional tons of oil country goods but has enhanced the value to you of the tons shipped.

In 1945 casing with 40,000 pounds per square inch minimum yield strength represented 30 percent of total casing production; by 1955 this was down to 13 percent. Casing of 55,000 psi minimum yield increased from 51 percent to 58 percent of the total. Casing with 80,000 psi minimum strength accounted for only 19 percent in 1945; by 1955 this grade and the new higher grades such as 110,000 psi yield strength amounted to 29 percent of the total. Material with 140,000 psi to 150,000 psi minimum strength has been produced on an experimental basis and first shipments are now in the field.

Yet there have been few periods—and those very short ones—during the last ten years when oil country goods in all grades were in free supply. During recent months there has been mounting evidence that a very tight situation was going to develop if petroleum industry plans for future drilling were to be carried out.

Stalemate in '54. In 1954 the oil and gas industry laid few pipe lines, and for one period of three months, every large electric weld pipe mill in the U. S. was shut down completely. Since early 1955, however, the oil and gas industries have developed forward plans to such an extent that the pipe mills have been flooded with orders. It is difficult to obtain any delivery promise on a major trunk line project before 1959 from any producing mill.

Under these circumstances, and particularly in view of the recent strike, future availability is of interest.

World consumption of oil is twice as great today as it was ten years ago, and is likely to double again within the next 20 years. Ten years from now domestic U. S. daily consumption of gas should increase from the present 25 billion cubic feet to 40 billion cubic feet. Domestic consumption of petroleum products will probably increase 53 percent and reach 12,800,000 barrels per day. There is no direct relationship between these figures and the amount of oil country goods required. However, it is estimated that in the 1960-1965 period, oil and gas operators will want to drill 65,000 wells per year on the average, that the wells will be deeper, and that the operators will require perhaps 3,200,000 tons of tubular oil country goods, or 26 percent more than they are now consuming. They will require an increased tonnage of other tubular products and other types of steel. Additionally, other steel consumers' demands are growing. It is probable that the steel industry will be called upon to have available perhaps 20 percent more steel than it can now produce. The American steel industry ingot capacity may have to be increased

from the present 128 million tons annually to 150 million tons annually, ten years from now. Additional rolling and finishing facilities to convert these ingots into usable steel mill products, including pipe and oil country goods, must also be built.

Steel's Problems. In a free economy, the existence of markets for any product or service is almost a guarantee that the product or service will be supplied if it is physically possible to do so. Steel is not an exception. It is well, however, to examine some of the problems faced by the steel industry. They can be better understood by making some comparisons with the oil and gas industry.

First, the difference between the flexibility in supply of steel's usable primary commodity. For the petroleum industry, raw material is oil and gas in the ground, discovered or undiscovered. It becomes a usable primary commodity when ingenuity finds it, confines, and has it ready for use at the wellhead. Steel's raw material is iron ore, coal and limestone. It becomes a usable primary commodity when provided in the form of cast steel ingots at the conclusion of the Bessemer, open hearth, or electric furnace refining operations. Petroleum has bottled up and in reserve, ready for use, a tremendous excess of productive capacity which can be drawn upon immediately to take care of unforeseen short term peak demands. Steel has an inflexible ceiling. Once the capacity of all the steel-melting furnaces has been reached, no temporary bulge in demand can be cared for immediately. New construction or modification is required, usually all the way from mines through transportation facilties, coke ovens, blast furnaces, melting furnaces, and primary rolling mills. Petroleum has other limiting factors in its capacity to transport oil and gas and to refine oil. Steel also has other limiting factors in its capacity to convert its steel into the desired end product. But the contrastingly different situations in the supply of the primary commodities—oil and gas at the wellhead, steel ingots on the pouring floor—must be kept in mind, because steel has a time element in connection with expansion which cannot be ignored. If a decision were made by any one of the many steel companies to install completely integrated facilities for the production of any steel product (say seamless oil country goods), it would be about three years from the time ground was broken until there would be any significant production of finished product.

Second, the difference between the petroleum and steel industries in their attractiveness to new investment capital. Petroleum has a record of steady growth which is almost unparalleled during the last half-century. Consumption of gas and petroleum products has increased over the previous year in almost every year since 1900. The steel industry since its inception has been known as the "feast or famine" industry. Even during the last ten years, which could be characterized as having the most consistently high operating rate in the steel industry's history, there have been sharp variations in that operating rate. Only two years ago, the steel industry operated at 69 percent of ingot capacity for nine months of the year. As pointed out earlier, only 18 months ago every large electric weld pipe mill in the U. S. ceased operations completely for three months. For 11 of the last 16 years, the steel industry's net earnings per dollar of sales have been below the average of all American industry. Although steel industry earnings were 7.9 percent of dollar sales in 1955, the average for the previous 16 years was 5.5 percent—and remember that this discussion is about an industry which requires such heavy capital investment that its gross sales annually are only slightly larger than its gross fixed assets. A very high percentage of the steel industry's total costs is represented by wages and salaries; a very low percentage of petroleum's. Such costs are constantly rising for both industries, but the effect on steel's total costs is greater and more immediate. Petroleum has had isolated work stoppages; steel has had recurring industry-wide shutdowns for extended periods. Such a background makes the steel industry less attractive to new capital investment.

The problem of providing capital for new capacity is made more difficult because new capital must be found each year to maintain existing capacity. Steel mill equipment must be replaced as it wears out or becomes obsolete. Such equipment has an average life of about 25 years. This means the steel industry must replace each year about 4 percent of its total plant. Theoretically, the depreciation allowed under the tax laws ought to be sufficient to cover this "stay even" cost. Such depreciation does recover over the life of facilities the dollars originally invested in them. Steel's construction costs over the past 15 years have been increasing at about 7 percent per year, compounded annually.

Because steel's plant and equipment last an average of 25 years, replacement costs are very much higher than original costs. Benjamin F. Fairless, president, American Iron and Steel Institute, in a speech before the Institute this spring, estimated that at 1955 prices, the industry must spend somewhere between a billion and $1.2 billion per year for facilities in order to stay even. Assuming a continuation of the cost trend, this figure may be $1.5 billion by 1960. This does not include anything for major capacity expansion, and by that time, only half of such an amount will be created from all types of wear and exhaustion reserves. Over the next five years, $3 billion of new capital will be required by the steel industry to "stay even."

The steel industry expanded from 100 million to the present 128 million tons of annual capacity under the stimulus of the Korean War. Rapid amortization under Certificates of Necessity was granted on that portion of each expansion which was deemed to be necessary for defense purposes. The expansion goals originally established now have been met on all steel products in common use. Consideration is being given, it is understood, to establishing new goals for certain products, which might or might not include tubular products for the oil industry. Such rapid amortization is desirable, and would have a stimulating effect on construction and steel supply to the oil and gas industries. However, whether original cost is written off rapidly in the first few years of the life of a plant, or at an even rate over the entire life, the fact remains that only the original cost is written off. In an industry such as steel, where equipment lasts an average of 25 years, such depreciation allowances are inadequate to provide funds for replacement of equipment when it has worn out or become obsolete.

ACKNOWLEDGMENT

From an address before the Alabama-Mississippi Division, Mid-Continent Oil and Gas Association, Mobile, Ala., Sept., 14, 1956.

Lovington's "old look" back in the days when this country was open-range cattle land. Forty years after the first oil well was hit in New Mexico, Lea County had one-twentieth of all the rigs in operation on the North American continent . . . and Lovington jumped into cityhood, the cars rolling by.

Back in 1911 New Mexico ranchers sympathized with their neighbor who drilled for water and struck oil. But 40 years later it led to . . .

Oil Boom On the Flat Plains

By CARL I. HUSS

ABOUT THE TURN of the century, E. M. and J. W. Caudle, merchant-traders of Seminole, Texas, nailed skids on an old store building, hitched burros to the store, and pulled it 50 miles across the flat-plains country into New Mexico.

Arriving at a selected spot, they unhitched the burros, and sent out word to the few, widely-separated ranch houses that there was to be a big barbecue and celebration.

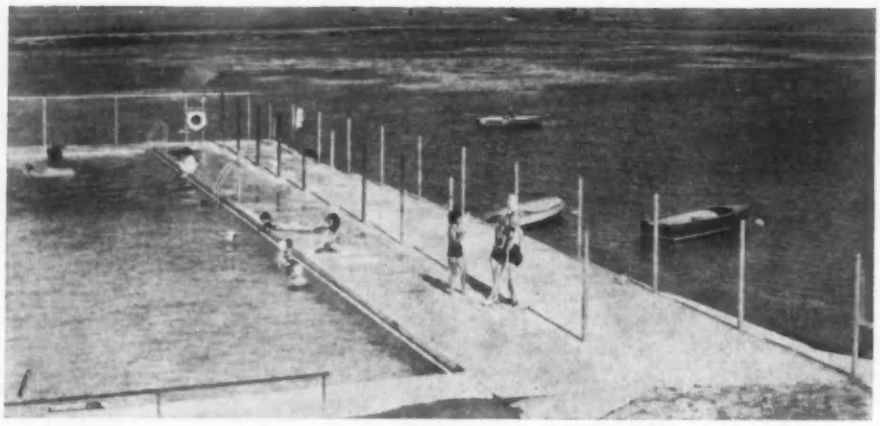
As the ranchers came in on horseback or in wagons, their broad hats slanted to keep the sun out of their eyes, they could see the store building from a great distance.

Near the store they observed what seemed to be a long box gliding slowly along. A man sat in the box making motions as if he were rowing a boat.

When the ranchers got closer, they could see it was a real boat, and a man sat in it paddling up and down a long ditch of water as if he were in the middle of the Rio Grande.

Briefly, the Caudles had noticed the tremendous flow of water brought up from a shallow well owned by a man named Love. They knew that plentiful water near the earth's surface, in an area of scarce surface water, could supply a town. In turn, they reasoned, the town would thrive as a trading center; ranchers wouldn't have to go as far for supplies.

Some distance from Love's windmill the Caudles dug their own well. And with water from it they filled the



Flat land lakes at Lovington are a recreation center.

ditch which was the nucleus of their advertising scheme. They knew a boat floating on real water in that dry country would cause talk.

J. M. Denton, Lovington, N. M., rancher on whose land the Denton pool discovery well was drilled, said this event started Lovington on its way.

"When I first rode into this country," Denton said, "there was nothing here to speak of."

The country was open-range cattle land. There were a few ranch houses, but there were no women; the ranchers kept their families in such towns as Midland, Texas, and Roswell, N. M.

"Except Florence Love," Denton said. "Love kept his wife with him."

Denton, 73 years of age, paused and looked from the window of his house on a Lovington side street. This home was the first he'd had in a town. From the time he was born in Oklahoma, Indian Territory, he lived on ranches. He moved to Lovington after the oil discovery on his land "to get away from the smell."

"I guess you should say Florence Love is the one who gave the town it's name," Denton said. "It was named 'Lovington' after her."

"Love and his wife lived in a dugout. It was somewhere around where the Llano hotel is now. He stayed there and looked after his cattle," Denton said.

Lovington was organized into a town in 1908, and consisted of a few houses occupied by ranchers.

If the ranchers of Lovington heard about the first oil discovery in New Mexico in 1911 they probably weren't impressed. If anything, they probably sympathized with the landowner. He was drilling a shallow water well in the Seven Lakes area of McKinley county in northwestern New Mexico when he struck oil.

Perhaps it's just as well that the Lovington ranchers didn't get excited, because it was to be 40 years before their community felt the impact of oil.

Additional drilling in the Seven Lakes area was disappointing and only small quantities of oil were found. However, the importance of the discovery went far beyond the small production, because it proved without doubt that New Mexico had oil possibilities.

With the first oil discovery in northwestern New Mexico, it followed logically that initial development centered in this area.

Drilling was extended to San Juan county and resulted in the discovery of gas at Ute dome in 1921 and oil at Hogback in 1922.

The Barker dome gas field was discovered in 1925. It is worth noting that due to lack of markets the original leases on Barker dome were allowed to revert back to the Indians, even though the discovery well was rated at 30 Mmcf. of gas per day.

Drilling and exploration in northwestern New Mexico continued throughout the 1920s and resulted in the discovery of oil at Rattlesnake in 1924, oil at Bloomfield, also in 1924, oil at Table Mesa during 1925, oil at Hospah, and gas at Blanco during 1926.

By 1930, about 12 oil and gas fields had been discovered in northwestern New Mexico.

Interest in southeastern New Mexico began about 1925 due to the discovery of new oil fields across the nearby state line in Winkler county, Texas.

The first Permian basin oil discovery and one of the first major oil fields in New Mexico was the Hobbs field in Lea county, discovered in 1928. By 1930 it was labeled the most active field in the U. S.

A tent city sprang up almost overnight at a site where only days before there was one house, a windmill and two trees. The city of Hobbs, N. M., was on its way.

The next 10 years were a "nightmare" of growth and activity . . . Hobbs was rated the fastest growing city in the country from 1930 to 1940. (Today the population is estimated at 22,000.)

Some 20 miles to the north and west, Lovington dozed, still a small ranching town. But it was soon to be awakened.

In the spring of 1948, a deep test was drilled in North Lea county which became known as the "Sawyer Discovery." Good production was hit in the Devonian at about 12,000 feet.

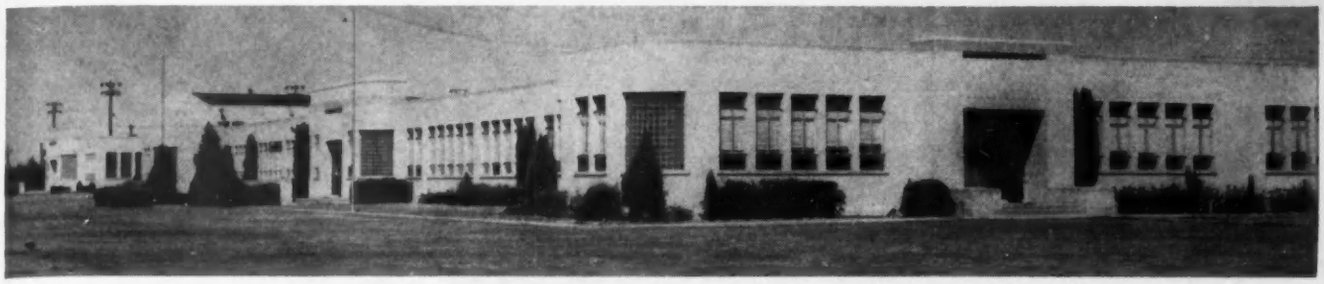
Based on this discovery and extensive geophysical studies, the major oil companies and some independents drilled into the deeper strata in the area serviced by Lovington.

The 1800 citizens probably didn't realize it, but their town was on its way to becoming a city.

The Denton pool nine miles northeast of Lovington was hit in 1950, and by April, 1953, had 96 completed wells and was producing nearly 21,000 barrels of oil a day.

At present there are 200 completed wells and total production is almost

Lovington's modern electric power plant supplies power to 4990 customers.



One of the new school buildings. Valuation of school district jumped from $7.5 million in 1947 to $45 million in 1955.

33,000 barrels a day. Denton pool is said to be one of the most prolific pools in the entire Permian basin.

During 1951 and 1952 from 115 to 137 wells were being drilled in Lea county at all times. That represented more wells than were being drilled in any three counties of West Texas during the same period. One hundred and thirty-seven represented about one-twentieth of all the rigs in operation on the North American continent.

By August 1, 1955, Lea county had 6327 completed wells in 102 different oil pools. Production from Lea county amounted to 239,443 barrels a day, 89 percent of the oil produced in New Mexico.

With that kind of oil activity, Lovington hummed. The 1950 census showed a population of 3000. Two years later it had jumped to 6500, and today stands at more than 10,000.

Sleepy main street soon took on a new look. Old buildings were ripped out and replaced by larger, more modern structures.

Building permits jumped from 96 with a total value of $306,250 in 1948 to 568 with a value of $2,613,692 in 1954.

During 1951 and 1952 alone 500 houses were built, and home building continues at a rapid rate.

Postal receipts rose from $21,329 in 1948 to $75,523 in 1954.

Bank clearings jumped from a little over $18 million in 1947 to nearly $47 million in 1954.

All the major producing companies and many independents jumped into the activity in the northern half of Lea county.

Included were: Gulf Oil Corporation, McAlester Fuel Company, Continental Oil Company, Sinclair Oil & Gas Company, Aztec Oil & Gas Company, Magnolia Petroleum Company, Humble Oil & Refining Company, The Texas Company, Phillips Petroleum Company, Shell Oil Company, Stanolind Oil & Gas Company, The Ohio Oil Company, Mid-Continent Petroleum Corporation, Amerada Petroleum Corporation and Cities Service Oil Company.

Hard on the heels of production came the pipe lines, including Service Pipe Line Company, Magnolia Pipe Line Company, Texas-New Mexico Pipe Line Company, and Gulf Refining Co.

Halliburton and other service and supply companies came to Lovington adding to the prosperity.

But that wasn't all. Refineries and processing plants came to town, too, including:

- The Atlantic Refining Company refinery in the Denton pool that produces butane and propane gas and raw gasoline;
- Warren Petroleum Company plant that processes the gas in the Gulf, Saunders, Bagley, Hightower area west of Lovington;
- The Grimes refinery, a smaller plant, that operates in the South Lovington field, six miles south of town;
- The Denton gasoline plant northeast of Lovington that is designed to handle 20 Mmcf. of gas a day.

Unlike oil boom towns of 30 or 40 years ago, Lovington didn't suffer the indignities of drunken brawls and shootings. Oil men pouring into the community have become solid citizens as evidenced by the fact that this year oil company employes preside over the Chamber of Commerce and the Lions Club.

Oil dollars have financed new schools with a 1955 valuation of $45 million. Contrast that with the 1935 valuation of $694,357, or even the more recent 1945 valuation of $6 million.

School enrollment jumped from 938 in 1948 to 3158 in 1954.

Oil money has brought more recreation to the community, including a country club with a nine-hole golf course.

Easley's Twin lakes, two miles out, is a haven for relaxation. Swimming, boating, fishing and park facilities are included in the grounds that play host to thousands of local people each year.

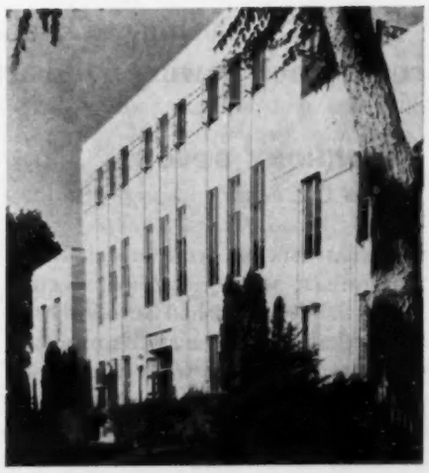
A new park for baseball and softball hums with activity almost every night during the summer season.

As for the general prosperity of the community, one example will suffice:

The citizens wanted a new courthouse, so they built one. Did they float a bond issue to pay for it? No sir, they plunked down the cash—one million dollars!

Were promoters E. M. and J. W. Caudle living today, they would be proud of the city they founded. However, oil has created more talk than their boat floating in a ditch ever did.

—The End



The million dollar Lea County courthouse was paid for—in cash.

'Old Faithful,' discovery well of the Cushing, Oklahoma, oil field, undergoing fracture treatment which brought this famous well back to life. The well was originally completed in 1912 and produced until 1948 when it was abandoned. In August the well was worked over and fracture treatment applied. After recovering the frac oil the well made 272 barrels of new oil in 10 hours. Initial production of the discovery well over 44 years ago was 120 barrels of oil a day.

Old Faithful Flows Again

Cushing, Oklahoma, discovery well, once abandoned, is reworked and comes back flowing 648 barrels of oil daily.

By ANTHONY GIBBON
WORLD OIL Staff

OKLAHOMA OIL MEN, especially the oldtimers, were electrified recently when the word flashed across the oil patch that one of the state's most significant discovery wells which had been abandoned for more than eight years, had made a spectacular comeback.

"Old Faithful," the well that started the Cushing oil boom in Oklahoma, after a re-work job, came in flowing 648 barrels of 38-gravity oil per day. It had been plugged and abandoned back in 1948 at which time it was producing one barrel of oil and four barrels of water per day.

The well's phenomenal comeback is due to advanced technology and methods which were unknown even ten years ago. By successfully applying today's modern production methods "Old Faithful" was brought back to life again.

Officially, "Old Faithful" is known as C. B. Shaffer et al's Wheeler 1, located in the SW NW NW of Sec. 32-18n-7e, Creek County.

The well was completed April 1, 1912, as the discovery for the fabulous Cushing oil pool. This well

started one of the most spectacular oil booms in the petroleum industry's nearly 100 years of existence. It came in more than 44 years ago for an initial production of 120 barrels per day.

It opened a field which has produced more than 400 million barrels of oil and helped lubricate two World Wars. It started a stampede to this new "El Dorado" which attracted oil men from Tulsa, Pennsylvania, Ohio, West Virginia, Indiana, Illinois, Texas, California, Wyoming and several foreign countries.

Shaffer and his associates, including the late Tom Slick, world-renowned wildcatter, completed the Wheeler 1 at a depth of 2208 feet. The well is located one mile north of the present site of Drumright and 12 miles east of Cushing.

Through the years the well's production declined to about a barrel a day and it was deepened to 2250 feet from where it made 15 barrels of oil per day for a long time.

Shaffer sold the well and the 160-acre lease on which it is located, to Deep Rock Oil Corporation late in 1928. This company continued to operate it for another 20 years when it finally abandoned it.

On Aug. 1, 1954, General American Oil Company of Texas, with headquarters in Dallas, acquired "Old Faithful" among other assets included in a sale of all of Deep Rock's producing properties.

Credit for the well's spectacular comeback goes to General American and its engineering and producing staff. Special credit is due A. L. Rhodes, division superintendent of production of General American, with headquarters in Tulsa, who had general charge of the workover operations. Others involved in this history-making operation include C. O. Arnold, foreman, and R. N. James, district superintendent for General American at Seminole, Okla.

In 1955, General American completed two producers just south of the Wheeler 1 and these wells maintained a steady production of 30 barrels of oil a day. This success prompted company officials to deepen and rework the old discovery well in hopes that it might at least produce as much as the wells nearby.

On August 10, 1956, General American rigged up for a workover job. The well was deepened to 2586 feet where 4½-inch casing was set in the Red Fork sand and the zone perforated between 2528-50 feet. When the casing was perforated the well started making one barrel of oil an hour, with some gas. Shut-in pressure was 250 pounds at the end of 12 hours.

Shown is the marker commemorating 'Old Faithful,' known officially as Wheeler 1 in Creek County, Oklahoma. It was erected after the well was abandoned in 1948. The plaque reads: "Site of the No. 1 F. M. Wheeler, discovery well of the Drumright-Cushing oil field. It's completion by C. B. Shaffer et al on April 1, 1912, set off one of the greatest oil booms in history. The well produced oil for more than 35 years."

Then General American took advantage of one of the greatest and most important advancements in crude oil production practices—fracture treating of oil bearing formations.

A service company was called in to fracture-treat the well and the job was performed successfully, using 20,000 gallons of oil and 20,000 pounds of sand. Following the treatment the well recovered the frac oil and orders were given for a production test.

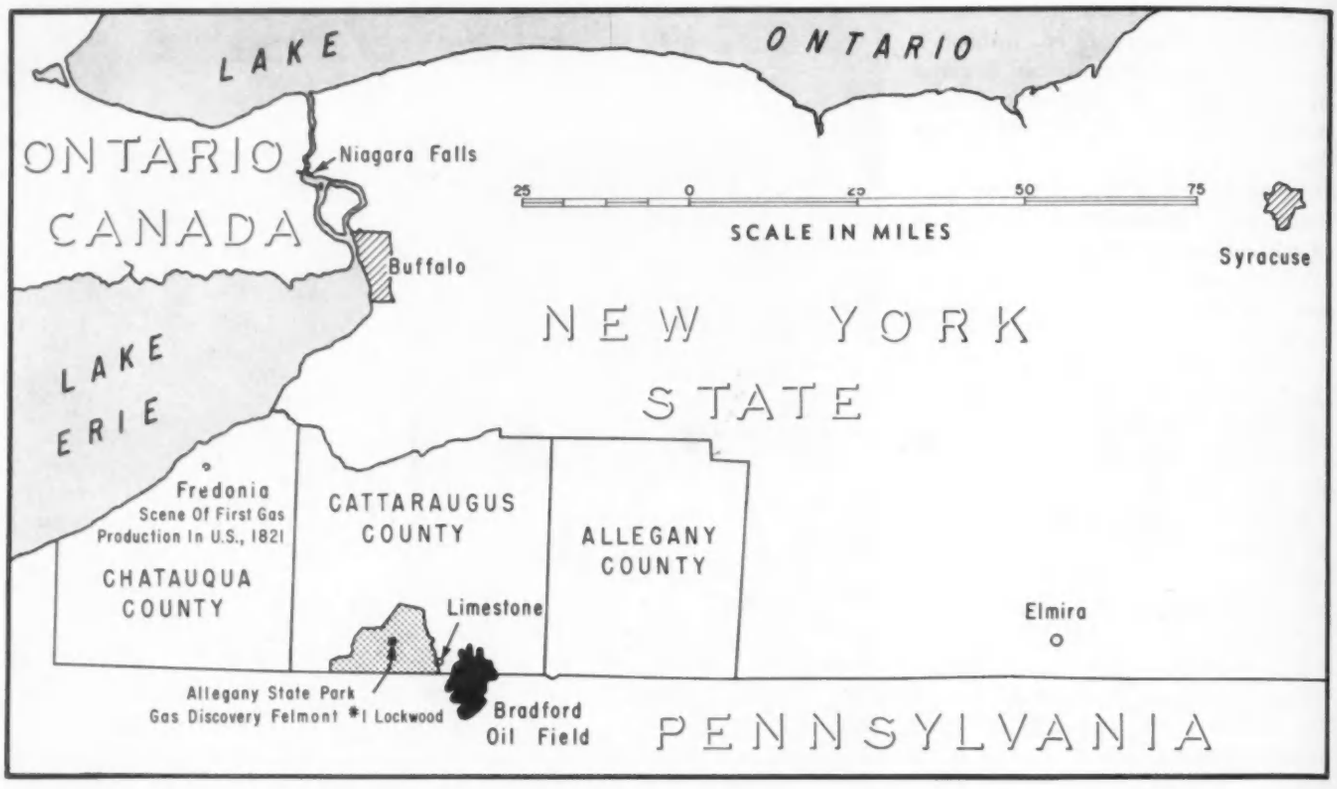
A 23/64-inch choke was installed and the well opened up. During the first 10 hours of the test the well flowed 272 barrels of 38 gravity oil and registered pressures of 500 pounds per square inch on the casing and 150 psi on the tubing. Shut-in pressure was 750 psi, unusual for such a shallow depth.

The well has been temporarily completed at present depth in the Red Fork. Electric log determinations however show porosity in additional zones. In deepening the well, good oil shows indicative of commercial production were found in the Prue sand between 2303-30 feet; the Upper Skinner sand between 2407-30 feet and the Lower Skinner sand between 2457-66 feet.

Later, the company may consider dual production from these and other horizons. Thus its output may be increased still further.

There are 14 producing wells on the Wheeler lease, including the discovery, and the operator indicates that some of these old wells may be deepened and fracture-treated.

Because the Cushing field has played such an important part in the growth of the oil industry in Oklahoma, revival of "Old Faithful" is especially gratifying to oil operators and others in Oklahoma whose economic life depends on oil. —**The End**



New York Discovery Being Developed

• New field in Cattaraugus County, New York, yields gas and distillate from Oriskany sand.

• Four producing wells have been completed. Drilling continues. Eight operators are active in area.

• Dry holes have somewhat limited the potential extent of production.

• Accumulation is indicated to be in a stratigraphic trap, with Oriskany pinching out to northwest.

By HARRISON T. BRUNDAGE
World Oil Staff

One of the most interesting events in the Appalachian province this year has been the development of the Allegany State Park gas-distillate field in Cattaraugus County in western New York state. The field was discovered in December, 1955, by Felmont Oil Corporation of New York City.

Felmont's discovery well, Lena Lockwood 1, is six miles northwest of Limestone, N. Y., not far from New York state's first oil production, dating from 1865, when its portion of the Bradford field was discovered. The Felmont well presented its drillers with a nice Christmas present. Gas and distillate flowed from the top of the Oriskany sand at 3754 feet. After the well was brought under control and cased, it was gauged at 8 million cubic feet daily, upon flow.

Since the discovery well was completed, three additional producers, two by Felmont, and one by Mid-Hudson Natural Gas Corporation of New York City, have been brought in. Drilling is continuing, with eight firms active in the area. The size and geology of the field or fields found so far are uncertain. Dry holes have limited the potential extent of the new productive area somewhat. A stratigraphic trap, with the Oriskany pinching out to the northwest, is indicated. Felmont's wells are already tied into Iroquois Gas Corporation's line running northward to Buffalo and adjacent consumer areas.

Lockwood 1 showed a high gas-distillate ratio, 600,000 to 1, during July,

1956. But wells 2 and 3, from which gas is stripped and distillate run into the same tank, together showed a ratio of 200,000 to 1 during the same month. This occurred, despite the fact that the two later wells are higher structurally than the first. Lockwood 1 is now making some salt water and appears to be an edge well.

Mid-Hudson Natural Gas Corporation's Blanche Graff 1, two miles down-dip (southeast) from the original discovery in the area, was to be connected to the pipe line on Sept. 1, 1956. This well was completed June 28. It very likely is on a different feature from the Lockwood wells or is separated from them by a permeability barrier. The Oriskany sand was topped at 4485 (—2248) feet, 155 feet lower structurally than Lockwood 1. As gas flowed immediately, drilling was stopped only six inches in the sand.

The Graff well was completed for 4 million cubic feet daily, open flow. Tests indicate a lower ratio than Felmont's wells—7 barrels of distillate per million, or about 143,000 to 1. The distillate is reported as clear, colorless fluid, with API gravity of 50 degrees or higher.

Though the operators are, of course, glad to have both gas and distillate, the latter is not the boon it would be in Texas. So far, Felmont has received an average of only about $1.70 per barrel for the distillate, after trucking expenses. The condensate is taken to the Kendall refinery at Bradford, Penn., five miles to the south, where it is blended into gasoline stocks.

After several recent price boosts, Pennsylvania Grade Crude, by contrast, now brings more than $4.60 per barrel. In Texas, distillate will often command a higher price than crude oil. The main difference is that Pennsylvania refiners are more interested in lubricants, and Texas refiners generally put a greater stress on gasoline.

Most Oriskany gas found previously has been very dry. A study published by the Appalachian Geological Society, Vol. 1, 1949, entitled "The Composition and Properties of Natural Gas in the Appalachian Fields," by A. J. W. Headlee, West Virginia Geological Survey, reported ". . . the ethane and higher boiling hydrocarbons are most frequent in the Pittsburgh-Huntington synclinal basin, and decrease outward to very low values in the outer fields. The methane content is highest in the outer fields and decreases toward the center . . ."

In the Kanawha-Jackson-Oriskany field, West Virginia, 61 wells were studied and average gas component figures were published in the same report. Only the three lightest hydrocarbons showed percentages exceeding one percent. Methane content averaged 85.57 percent, ethane 7.80 percent, and propane 2.71 percent. Heptanes and heavier components averaged only 0.13 percent, and only one inorganic gas (nitrogen) showed a significant percentage (1.93 percent).

In several gas fields near the western limit of the Oriskany sandstone, notably at Cambridge, in Guernsey County, Ohio, a thin oil rim occurs on the downdip side. It appears that the association of oil and gas liquids with Oriskany gas production is generally limited to accumulations at or near the pinchout. Oriskany production deeper in the basin, such as Leidy in Pennsylvania where pronounced structural trap governs accumulation, is characterized by very lean or almost totally dry gas.

Seldom has a wildcat been drilled in a more convenient location to hit gas than the Felmont discovery. The location was 500 feet from Iroquois' dual 16- and 12-inch transmission line to Buffalo. In addition, Home Gas Company has a triple set of six-inch lines and New York State Natural Gas Company has two 8-inch gas lines, all in the same vicinity. Small wonder that natural gas brings between 27 and 30 cents per thousand cubic feet to the local producer.

As is the case with so many Appalachian fields, the area could be active as a storage area long after the wells become depleted. Western New York, like other Appalachian areas, continues to expand gas storage facilities. On Jan. 24, 1956, the Federal Power Commission announced application by Iroquois Gas Corporation of Buffalo, N. Y., for authority to develop a new natural gas underground storage area in Chautauqua, Cattaraugus and Erie counties. Though the new discovery had no bearing on Iroquois' application, it is only 35 miles away, so Iroquois' reasoning applies to the discovery area, too.

The $2.9 million Nashville Storage Area project involves the drilling of 16 new wells, reconditioning 64 old wells, laying 14 miles of delivery pipe, 22 miles of gathering lines, and construction of a 900-hp compressor station. Iroquois said that the demand for additional gas for space heating has continued at an unprecedented rate in Western New York, rendering addition of storage capacity in the interest of its operations, its consumers, and suppliers. The application was granted by the FPC, as requested on May 11, 1956.

The discovery is unique in still another respect. Much of the acreage that is already proven or semi-proven, is in Allegany State Park and is owned, of course, by New York State. The wells that have been drilled recently, and those that can be drilled in the future, are all located on private property, or on state land, the mineral rights for which were retained by individuals when the land was deeded to the state. Western New Yorkers have been royalty-conscious for generations, and many of them who sold land when Allegany State Park was acquired in the 1920's, retained mineral rights.

So when the Lockwood discovery came in, precipitating a lease scramble, the problem facing landmen was to locate nearby private tracts, even those of one acre or less, and State tracts under which the state does not own the minerals, that might be leased. Here, the laws afford a very interesting and diametrically opposite situation, as compared to Texas, where Mineral Classified Lands entail stringent protection of the State's interest therein. On New York State Park lands and Forest Preserve lands, the state, in effect, has no mineral interest.

And, as in Oklahoma, drilling has affected Indian Reservation lands. Bottom lands beside a long stretch of the Allegany River in Cattaraugus County belong to the Indians as a reservation, pursuant to a 99-year lease authorized by Congress in 1892. New York State Natural Gas Corporation recently drilled a dry hole that tapped a hefty pocket of Oriskany gas, after completion of negotiations with the Seneca Indian nation for drilling rights on a part of their Cattaraugus County properties.

—The End

More and Better Engineers Needed

The oil industry can make a vital contribution in the world race for technical manpower if it will:

- **Go all out to help provide superior education for engineers.**
- **Increase opportunities for promotion and better pay.**

By JOHN M. CAMPBELL
University of Oklahoma,
Norman, Okla.

INDUSTRY AS A whole—and the oil industry in particular—needs more and better engineers. We must face facts—we are engaged in a technological race with our greatest competitor, Russia, and unless we win this race, we may even lose our freedom.

Why is the U. S. lagging behind in its race for more and better engineers? The problem involves two principal factors:

- Attracting students into engineering.
- Providing superior education for them.

The first problem has some discouraging aspects. Recent surveys show that only a small percentage of top high school graduates want to be engineers. Some students interviewed said that engineering school was too hard for the ultimate benefits. Industry, therefore, must make the engineering profession more attractive from the standpoint of remuneration and promotion to top executive posts.

Engineers are professional men but they've done a very poor job of selling the idea to the public as compared with doctors and lawyers.

They can increase their stature only through a vigorous "selling campaign" and setting certain standards before a man may practice as an engineer. This can be accomplished by:

1. Companies using the job title "engineer" only in those instances where that job requires a man with at least a B.S. degree in engineering.
2. Requiring by law that any person advertising or offering himself for hire as a consulting engineer be a registered professional engineer in his state.
3. Effectively preparing material that emphasizes the importance of engineers, and the attendant social and economic advantages —all geared to appeal to the psychology of the high school age student.

This appeal factor might appear at first to be a rather nebulous one, but it is significant that our international competitors are using it rather effectively.

The matter of better education is also an integral part of the problem for, as our technology advances, the demands on education become more severe.

One needs only to look at university records to become convinced that too many freshmen enter college inadequately prepared. This situation stems from the fact that some schools, because of size and/or finance, do not offer adequate science programs, or because students do not take them when offered. When students leave a high school ill prepared for college, it is not the fault of the principal or superintendent, it is squarely the fault of the local people for whom they work. It is a matter of record that a school is only as good as the constituents want it to be.

1. Better technical education in the secondary schools.
2. Improvement and strengthening of college curricula to meet our changing needs.
3. Providing and maintaining superior teaching staffs.
4. Providing proper and sufficient physical facilities for education.

It is even more perplexing when pre-engineering students do not take the courses when they are offered. Courses in driving, dancing, etc. are certainly important but are hardly a good foundation for the would-be engineer when substituted for mathematics, chemistry and physics. To solve this problem, professional groups such as the API and AIME should take the lead in providing:

- Advice to parents so that they might be aware of the educational needs of their sons.
- Consultation with high school students about the requirements (and advantages) of being an engineer.
- The leadership necessary to see that local schools are adequately staffed and financed.

The curriculum problem is the responsibility of the universities but professional societies can be extremely helpful in keeping the administrative officials aware of the needs.

The teaching staff problem is inevitably tied up with money. The serious shortage and subsequent demand for experienced engineers has left universities in a poor competitive position. Consequently engineering staffs are composed of men who do outside consulting to bring their income up to standards, or those who are willing to teach for less money. There are just too few of the latter.

It seems unlikely that the necessary funds will be forthcoming from state funds. A large number of voters in any state are not overly education-conscious and are more anxious to get a road by their home than support the university. It is therefore logical that their legislators vote accordingly. It is further felt that the proposal of more taxes for educational purposes would be political suicide. In view of this it would appear that industry must help out since the success of the school reduces

the cost of obtaining a finished engineer.

Although an occasional large gift from a foundation is laudable, it hardly makes a serious dent in the problem. Direct subsidization in the form of a simple gift except as an occasional award for outstanding work is not recommended for it carries the impression of charity; the giver often regards it as just a necessary evil and the recipient performs no particular tangible service for the money. Instead one or more of the following proposals should be considered:

1. Industry refer some of their engineering and fundamental research problems to the universities. This would make income available and would show a return to the company. Many fundamental problems could be solved through university facilities at less cost than in high overhead company facilities. More fundamental advances are possible because many company labs have to concern themselves with immediate operating or applied problems.

2. Provide bigger fellowships so that more scholars can afford to pass up lucrative starting offers and obtain Ph.D. degrees. Most fellowships now pay $100-$150 per month which is not sufficient unless the student has outside income. Since many of the students are married at that point the wife must work, unless there are children. It is a matter of record that there are not enough Ph.D. petroleum engineers to staff the schools let alone meet industry requirements.

3. Work out a program of lending a scientist to a university for a period of one year. If all companies cooperated there would be no noticeable drain on manpower and it would be good training for the man, help alleviate a staff problem, and give the students the benefit of the man's experience.

4. Have qualified professors conduct advanced and/or refresher engineering courses in district, division, area or main offices. This would free regular personnel for full time company activities and enable the use of professional teachers.

5. Institute cooperative engineering projects between the company and individual outstanding professors. Both parties would benefit from such an association.

Most companies have been very generous in the loan or gifts of equipment. This is sincerely appreciated and helps tremendously. If sufficient space is provided this problem appears to be easily solved.

If these things were done it would then be up to the universities to produce the type of men needed. It is through these channels that we have the best possibilities of removing the "Engineering Help Needed" signs and meet our educational challenges.

One stop gap measure involves the better utilization of trained engineers. It is appalling sometimes to see the semi-technical and clerk type chores often relegated to trained men. This is a natural evil for such men usually do the job well with a minimum of supervision. Consequently it is an evil that must be religiously guarded against for we are all prone to be subject to it.

The training of technicians to do these tasks is another of our problems but beyond the scope of this discussion. As our industry becomes more complex, however, some provision is necessary for this type of training.

In conclusion, it is evident that the leadership in solving these problems must come from engineers themselves, acting both individually and through their societies and companies.

—The End

If the U. S. is to win the technological *race* with Russia—everyone has to help increase our technological *force*:

The Oil Industry can help by:

1. Referring some of its engineering and fundamental research problems to the universities. This would make income available and would show a return to the company.
2. Providing bigger fellowships so that more scholars can afford to pass up lucrative starting offers to obtain Ph.D. degrees.
3. Working out a program of lending a scientist to a college or university for a period of one year.
4. Having qualified professors conduct advanced and/or refresher engineering courses in district, division, area or main offices.
5. Instituting cooperative engineering projects with companies and outstanding professors.

Oil Companies can help by increasing the prestige of the engineering profession. This can be done if each company will:

1. Use the job title "engineer" only in those instances where the job requires a man with at least a Bachelors degree.
2. Require by law that any person advertising or offering himself for hire as a consulting engineer be a Registered Professional Engineer in the State.
3. Effectively prepare material that emphasizes the importance of engineers and the attendant social and economic advantages—all geared to appeal to the psychology of the high school student.
4. Give the higher calibre students an incentive to enter the engineering profession by offering more attractive promotion plans and higher salaries.

The Public, with the aid of industry, can help by:

1. Demanding and supporting better technical education in the secondary schools.
2. Helping to improve and strengthen college curricula to meet our changing needs.
3. Supporting all financial efforts to provide and maintain superior teaching staffs.
4. Supporting all financial efforts to provide proper and sufficient physical facilities for education.

What's Wrong With Employe Communications?

A prominent psychiatrist prescribes remedies tailor-made to cure the "ills" of company communications.

By DR. ALAN A. McLEAN
Hartsdale, N. Y.

FAVORABLE EMPLOYE attitude is of major economic importance to every oil company. In fact, today more than ever before there are two good ways to go out of business. One is to miscalculate the economic side of a business. The other is to under-rate or over-simplify employe attitude.

A company can supply the best of equipment, materials and methods—and the worker can bring on the job the best training, experience and health. But, unless that employe's attitude is a healthy one, he won't turn out much work.

The key to creating an atmosphere of healthy employe attitude is the practical application of well understood concepts and policies of good communications. In turn, the real problem in applying these concepts and policies is to make an employe feel as important as he really is; by making him as important as he is capable of being.

To properly tackle such a problem, management must first know a great deal more about the individual worker and the way he reacts to various types of communication—to various patterns of behavior, stress, emotions, worries and what he really wants out of the job.

One of management's major objectives is to promote a climate favorable to the growth of understanding. How can this be accomplished through employe communications?

Feedback—The audio-engineer who studies communication by means of electrical circuits and oscillographs is inclined to think in terms of a communicated signal. The prime signal and its clarity are important to him, but he recognizes certain patterns of interference which add distortion to the original signal which he attempts to minimize. He also has some control over clarity of the original signal and the amount of distortion. He monitors what he hears and in doing so has to maintain a continuous check upon the fidelity of the sound. In so doing, he is able to keep a close check on extraneous noise. It is the process of continuous feedback of information about the final signal that keeps him posted on its quality.

With a sound, he is quite aware of the fact that the more distortion, the less information coming across and of course, the less the noise, the greater the clarity of the information. In short, the undesirable interference with the communication monitored by the audio-engineer is measureable through a process of checking the signal at various points to determine the amount of distortion.

The industrial communicator has

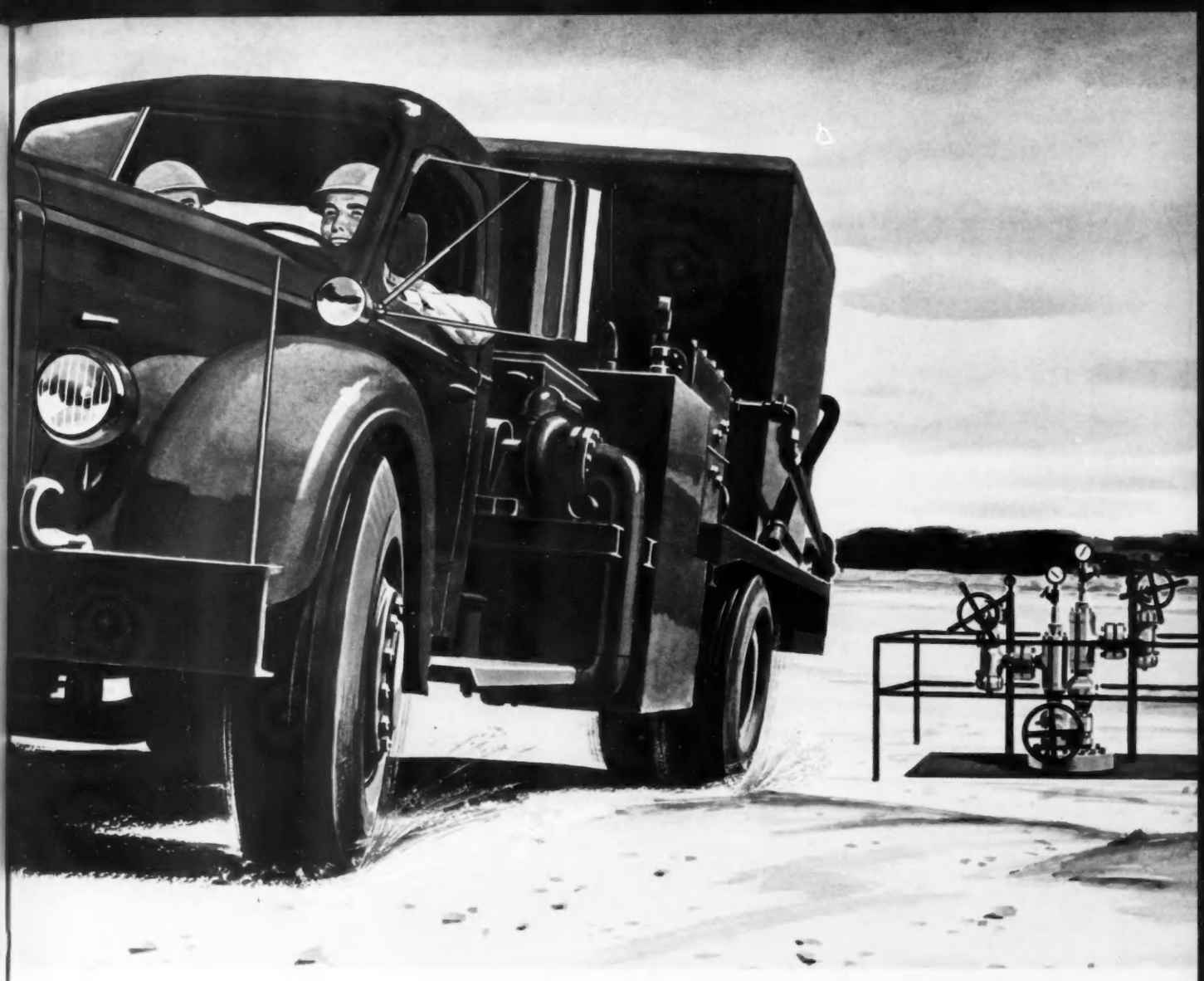
There Are Four Basic Fallacies in Modern Management's Approach to Employe Communications:

1. **Handling of Initially Negative News.** At times, in an effort to clarify misleading information and rumors, management may issue a denial. On the face of it this seems quite logical. But, when presented without explanation and in a seemingly critical and contradictory fashion, they only serve to arouse feelings of hostility.

2. **Overcommunication.** In an effort to communicate effectively, some managements overdo the process and swamp the circuits with too many messages. **The time to communicate is when you can answer more questions than you raise.**

3. **Distorted Communication.** It is not always easy or possible for the receiver to identify the underlying attitude of the sender. When management takes for granted that its message will be perceived by the employe as being sincere and straightforward, this is quite often not the case.

4. **Communications Lack.** Many companies suffer from a dirth of information flowing either up or down communications channels. No business can be conducted in a vacuum. This is particularly so in the dynamic oil industry.



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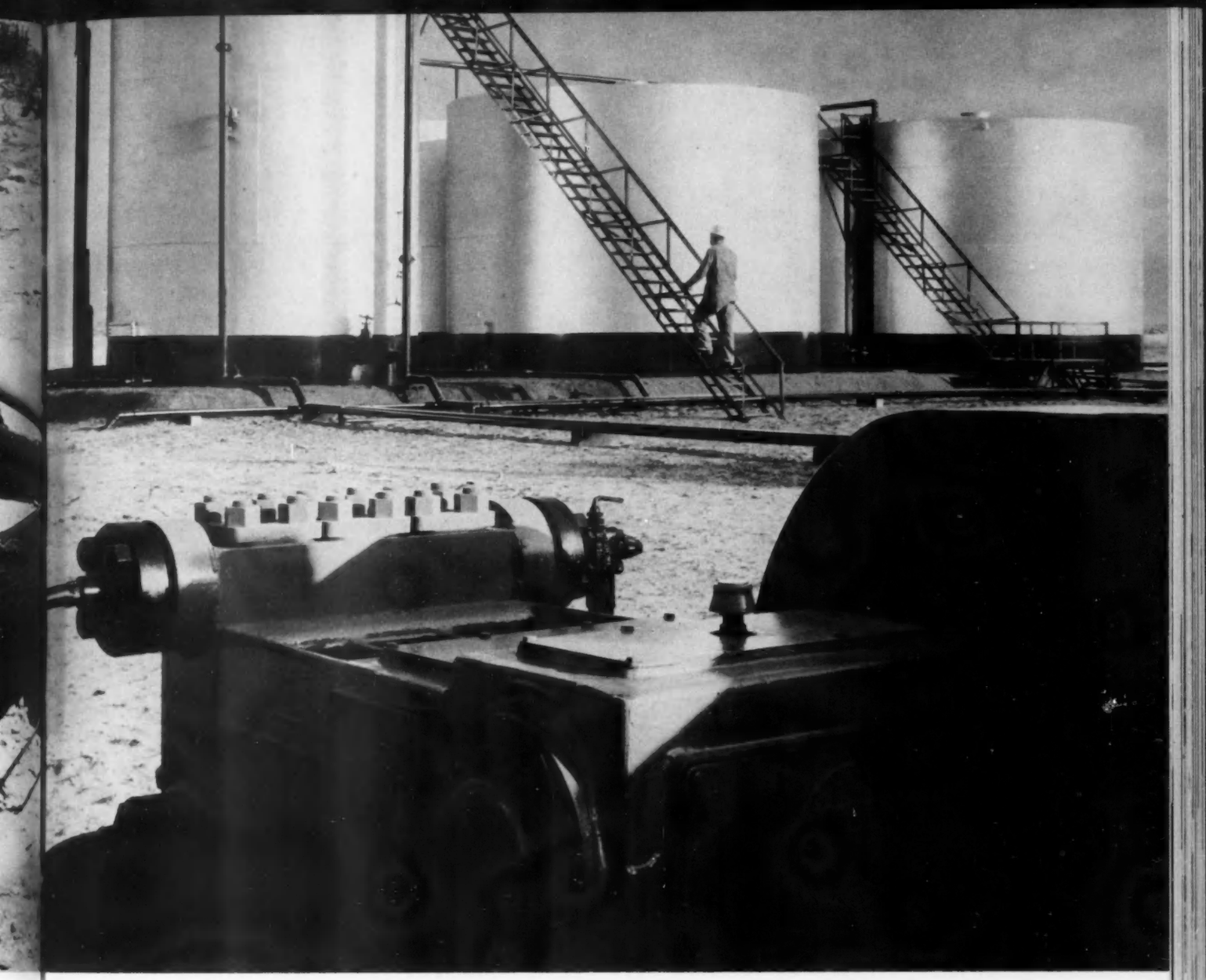
*Patent Pending



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On the next page: more National equipment for profitable production!

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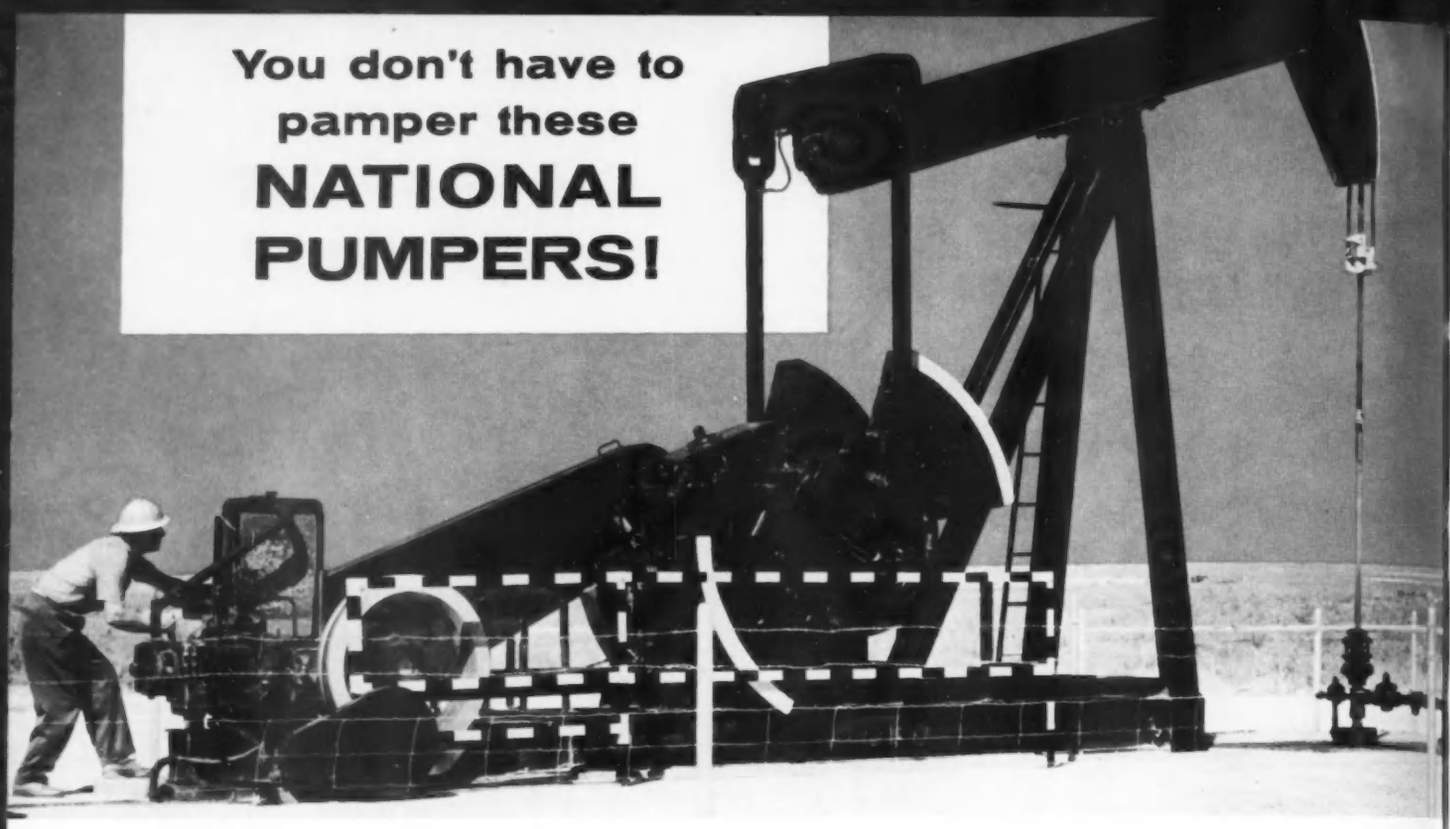

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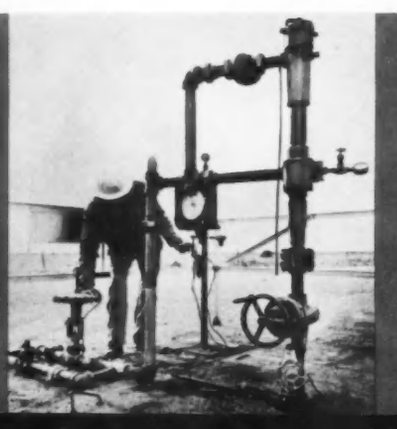
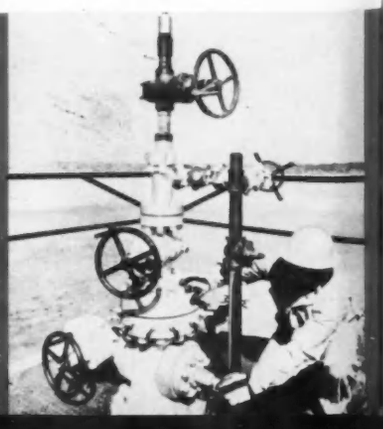




no such built-in feedback reports to accurately indicate the effect of his communicated information and the clarity of his signal. To be sure, he has some indications of the receptivity and the reaction of his audience. These are not entirely accurate and offer many limitations. The signal cannot be changed or monitored as it eminates from his pen.

The first major point then, is that *we cannot think of clear cut, precise message reception.* We must also consider that *interference and distortion itself conveys valuable information.* The editorial comment accompanying factual information is sometimes far more important and more meaningful to a group of employes than bare facts.

Management is concerned with the transmittal and exchange of information in the industrial setting. Management recognizes the increasingly important role of such communication in the effective conduct of business. The oil industry in particular, a leader in advances such as automation, feels that it must keep ahead of most industry in the quality, accuracy and mobility of its communications processes.

A reduction in the amount of interference, noise, static and distortion in communicated messages is important. So, too, is understanding of the noise and distortion when it is present. And understanding reasons behind the seeming distortion and static is equally important.

The psychiatrist generally is struck by the fact that no single message has the same meaning for each person involved. Each brings into the communication system individual motives, values, feeling and in short, his individual background and way of looking at things.

With the need to communicate clearly and be understood on the one hand and with the tremendous difference in receptivity on the other, problems are posed for industrial communication. It must be understood that some barriers to communication can never be entirely surmounted.

How does one communicate? The smile on the face of the supervisor as he circulates a memorandum from top management is perhaps more important than the memo itself. By leaving unsaid as well as by saying, by ignoring rumors or by answering them, by verbal inflection and attitude, communication is born.

Let's take a look at several currently popular methods of communication on the industrial scene.

Initially Negative News—At times, in an effort to clarify misleading information and rumors, management may issue a denial. On the face of it this seems quite logical. The same automatic, almost reflex impulse to communicate in order to deny is found more often in day to day relationships in any plant. Sudden contradictions and exceptions to long established procedures and policies are occasionally necessary. But when presented without explanation and in a seemingly critical and contradictory fashion, they only serve to arouse feelings of hostility.

For instance, if a news story in a company publication were to report that it was *not* true a certain number of plants were to be sold to a competitor, feelings of insecurity and anxiety would develop in many individual employes. And if a first line supervisor were to abruptly challenge, without explanation, the way a technician was handling a routine assignment, he would meet with considerable resistance.

Presenting information of any sort in a negative way is always likely to arouse suspicion, doubt, resentment and hostility. On the other hand, with explanation of the reason why a company feels it necessary to present negative news, there is a fair chance of allaying these same feelings.

Overcommunication—In an effort to communicate effectively, some managements overdo the process and swamp the circuits with too many messages. These may include needless exhortations, petty comments and irrelevant details. It may include bringing too many people into a problem. It may mean a barrage of so many formal and informal communiques, magazines and newspapers and policy statements that it becomes impossible for any employe to keep up.

In any of these situations important information is apt to be lost in the shuffle. It is certainly possible to overdo a good thing. Another aspect of overcommunication is what might be called communication *before the fact.* This refers to communications of half-formed policies and also to rumors that are intentionally spread to sound out various groups of employes—the well known trial balloon technique.

Many necessary industrial moves, such as the relocation of machinery or the introduction of new procedures, involves change for individual employes. Any communications on these subjects is liable to be anxiety producing. Premature news concerning these subjects can be disturbing. *The time to communicate is when you can answer more questions than you raise.*

Distorted Communication—The underlying attitude and feelings, the individual values and ideas of individual employes—all these must be taken into account in planning a communication or in working on a communications problem.

We might say that the effectiveness of any given communication is determined by its clarity and even more, by what the receiver understands of the spirit behind it. Yet it is not always easy or possible for the receiver to identify the underlying attitude of the sender. When management takes

(Continued on Page 124)

About the Author

ALAN A. McLEAN is a psychiatrist, serving American Cyanamid Company and New York Telephone Company as a psychiatric consultant, Cornell University as a faculty member in its College of Medicine, and The New York Hospital as part of its attending staff. Educated at the University of Washington in Seattle, New York University and Long Island College of Medicine, Dr. McLean received his psychiatric training at Western State Hospital in Tacoma, Wash., at Oregon State Hospital in Salem, and at Cornell in the College of Medicine and the School of Industrial and Labor Relations. While at Cornell, he held a two-year fellowship in industrial psychiatry sponsored by Carnegie Foundation. Part of this fellowship was used in a project regarding the selection of overseas employes for Standard Vacuum Oil Company. Dr. McLean's professional experience also includes service with both the Navy and the U. S. Public Health Service.

How to Conduct a Successful Interview

The formula is simple: set up a specific plan and let the interviewee do most of the talking.

By DR. HAROLD A. EDGERTON, Vice President
Richardson, Bellows, Henry & Company
New York, N. Y.

INTERVIEWS, THE most used personnel tools in industry, are also the most misused tools.

When two interviewers independently interview the same person, seldom do they come up with the same conclusions. There is not even adequate agreement among interviewers who participate in or listen to the same interview!

The two most common faults in interviewing are lack of a specific plan for conducting the interview—and failing to let the interviewee do most of the talking.

These flaws in interviewing technique can be easily eliminated through self appraisal. Check your own interviewing methods against the following suggestions for an ideal interviewing plan—you will find they are designed to help you improve interviewing skills.

Establish Your Objectives—The first step in improving skills is to define just what you want the interview to tell you. Such definitions are best expressed in terms of questions. For example: "Has this man had experience which should make him a good field geologist?"

You need to know, of course, what kinds of experience are pertinent to the question, and just which experiences indicate a good field geologist and which would suggest mediocrity. "Is there anything in his background which would indicate that he might have trouble in getting along as a member of a field party?" Friction with associates, attitudes of looking down his nose or belittling associates, being the "big I am," being strongly opinionated, and the like, may be indicated for this question.

Does he have characteristics which might make him an undesirable employe? What are his motivations? Why does he want the job? What are his ambitions? Why did he leave former jobs, etc. All these may bring out some useful evidence on motivation.

The second step is to list—write them down on paper—a number of topics for discussion to bring forth information which will shed some light on the questions you want to answer. These will, of course, be related to your purpose. Some of these questions might be: How did you like the people in that organization? Who was your boss on the last job? How well did he know his stuff? What kind of a situation do you expect/hope to have ten years from now? Just what did you do on that job? Any headaches in supervising a group like that?, and so forth.

Next you will need to know something of the man you are going to interview. Why is he coming to the interview? How is he likely to react to the interview? Does he have a particular point of view which you should consider?

Interviews should be held on schedule, with a minimum of inconvenience. The place of the interview should provide sufficient privacy for the purpose and topics of the interview. The more personal the interview the more privacy needed. Privacy may be either auditory or visual, usually both. Privacy also includes freedom from interruptions, and from distracting noises and events.

Above all, be ready to listen. Listen to what the interviewee has to say in response to your questions. Listen to how he says what he has to say as well as to what he says.

Most situations permit you to take notes. Do that inconspicuously but not secretively.

Conducting the Interview—Gain and deserve the confidence of the man you are interviewing. Keep his confidence throughout the interview. Your interviewee can "give" more and better when he is at ease and when he knows the purpose of the interview.

First of all put your man at ease. Greet him like you are glad to see him. See that he is physically comfortable, a good chair, not facing the light, etc. Start the conversation yourself, talking briefly about things unrelated to the interview but of interest to your man. Give both of you a chance to relax and feel at ease with each other. Then you are ready to go ahead with your interview.

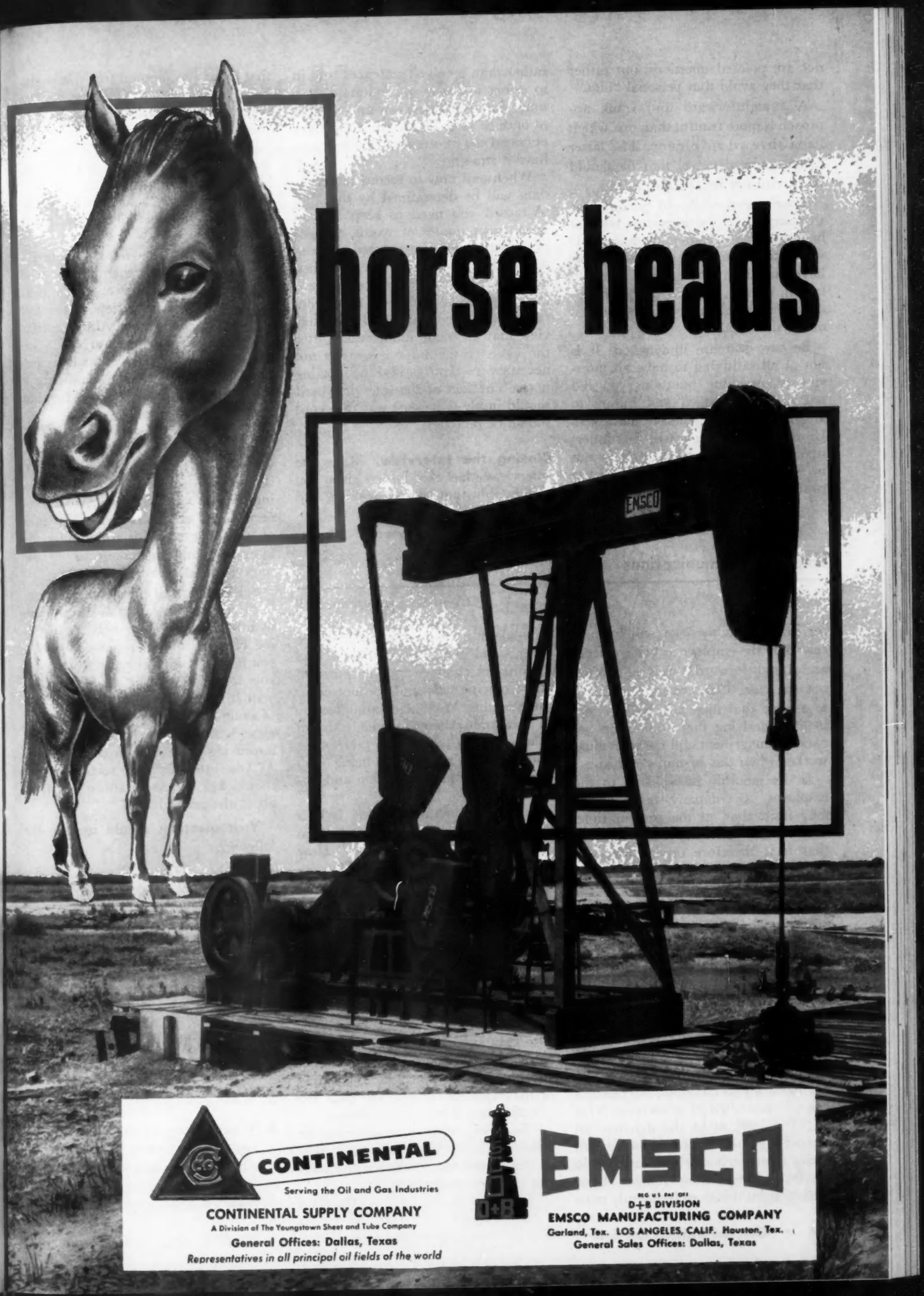
Begin with an explanation of the purpose of the interview. Indicate how he relates to the purpose, why he should be interviewed, and in general, what you expect to learn from the interview. Start with questions which are general, questions which give the interviewee an opportunity to talk. Questions should be the kind which call for longer answers and cannot be answered by a few words or a yes or no. Such specific questions may come later. Frequently they will be answered before they are asked, if the man is given a chance to tell about himself in his own way.

As interviewer, you have two jobs: to be a good listener, and to provide the questions and comments which enable the interviewee to create the answers which you are seeking.

Once the interview is really "warmed up," probing questions may be used to clarify information, attitudes and feelings. Such questions should be asked as a means of getting better understanding, more detail, a clearer picture of attitudes and feelings, never as cross examination.

Your purpose is not that of provoking an argument, but that of understanding clearly the man who is being interviewed. Sincerity, patience and understanding are useful for this purpose.

Avoid putting your man on the spot or making him look stupid or foolish. This does not mean that you should



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not ask pointed questions, but rather that they avoid that personal "bite."

A straightforward and frank approach is more fruitful than one which looks shrewd or clever. The latter makes your man feel that he should be careful not to step into a trap.

Your questions should be aimed at the purpose of the interview but not be loaded or leading questions. If your questions imply answers, you have biased the interview and obtained, in part, support for your preconceived judgment of the individual or his situation.

Be sure you are understood. It is not at all satisfying to have an interviewee answering questions you did not think you asked and failing to answer those you believed you asked. Use language which will be understood by your interviewee. It is not necessary to use his language, but use common clear words. Use simple rather than involved sentences, and in so doing ask only one question at a time. Interpret the answers you hear at once so as to be sure that you have obtained the information you seek and have it straight.

When and how to record interview data will be determined by the kind of record you need to keep. If you want exact quotes of words, phrases or sentences, or if you need to keep a considerable record of details, then make notes as you interview. If general impressions, without much detail, are required, records of the interview may be made immediately after the close of the interview. It is not necessary to apologize for making notes. The fact of the interview itself should imply that some sort of record should be retained.

Closing the Interview. Make the interviewee feel that he has given you information that you are seeking, and that he has cooperated freely in so doing. He should also feel that he has benefited from having talked with you. Such closing comments as the following may help to terminate the interview on a pleasant note. "You have given me a good picture of your background," or "You have helped to clear up a number of points in my thinking."

Commitments should be made regarding time of further action, who will take such action, etc., if the purposes which the interview serves call for such further steps. Allow no implications of further action which are not really honest. Dont's let it be implied that he is the top candidate if he is not. Frankness is called for, but not brutal frankness.

How to Improve Your Interviewing—The brief suggestions given should help improve your interviewing techniques. The two most common faults in interviewing are lack of a specific plan for conducting the interview, and in failing to let the interviewee do most of the talking.

Self-criticism of ones own performance, and if you can take it, criticism by others are effective tools. A recording of your interview played back to you later furnishes the opportunity for you to hear yourself as others hear you. It may be noted that this method of using recordings of one's own interview is one of the best devices for improving your skill in interviewing. As you listen to your recording you should ask yourself some questions about the performance.

Your questions should include the following:

1. What evidences were there of a specific plan in the interview?
2. In, what ways did the interview wander off the subject and purposes?
3. Did the interviewee answer the questions you asked?
4. About what percent of the interview time was occupied by your own talking?
5. What questions did you fail to ask?
6. What different conclusions regarding the interviewee or interview results do you reach after hearing the interview as an observer rather than a participant? —**The End**

Employe Communications

Continued from Page 119

for granted its message will be perceived by the employe as being sincere and straightforward, this is quite often not the case. One common pitfall is to assume that there is a basic agreement underlying the relationship between management and the individual worker when this is simply not so.

In its monthly news letter to the employes, a company management may insist that, at the present time, industry is extremely competitive—that it is therefore urgent for each worker to increase his output so that the company may continue to get its share of available orders. This would seem to be perfectly reasonable. Yet it may be interpreted by employes as an attempt to simply speed up production with an inevitable lay off around the corner once current orders are filled.

Communications Lack—Many companies suffer from a dirth of information flowing either up or down communications channels. No business can be conducted in a vacuum. This is particularly so in the dynamic oil industry. A lack of communication seems most particularly destructive in the face of impending change. Major management decisions frequently must be made in a relative vacuum. On the other hand this does not mean the majority of changes must be put into effect precipitously and without accurate warning. With no communication in a situation where it is widely known that a change is about to take place, many rumors spring into being with the result of much confusion and uncertainty.

A partial communications lack is embodied in the policy, "We tell them only what they want to hear." How smart a maneuver is this? This occasionally applies to communications directed from management to the hourly group. But passing only pleasant facts upward through various levels of management is more often the case and contributes to gross inefficiency. Sure, we all like to hear about the good things of life. No one likes to arouse antagonism in his supervisor. The creation of a climate in which such communications can be presented without fear of unjust reprisal is one of management's important tasks for effective two-way communication.

The cornerstone of sound employe relations is the practical application of well understood concepts and policies of good communication.

—**The End**

How Many Movies Have YOU Produced?

Did you say none? Well, the truth is you have helped make *nine* movies! In fact, you—the men and women of the oil industry—are also the stars of all of them!

Each year your Oil Industry Information Committee produces a new film that tells the story of oil—*your* story. This year's film—"Destination Earth"—is a Technicolor cartoon. It shows why Americans are served far better by our free competitive oil industry than they would be by a government-controlled oil industry.

How can you make your movies pay off for you? *You* can be the person who makes these nine films available to your social or church groups as well as local theaters and schools. For more information about how to obtain these films write to your OIIC district office—or to the address below.

The Film Program is only one of the many ways the OIIC helps win friends for the oil industry and build better public relations for you. By putting OIIC materials to work in your community you'll not only help your industry but you'll experience a great feeling of personal satisfaction as well.

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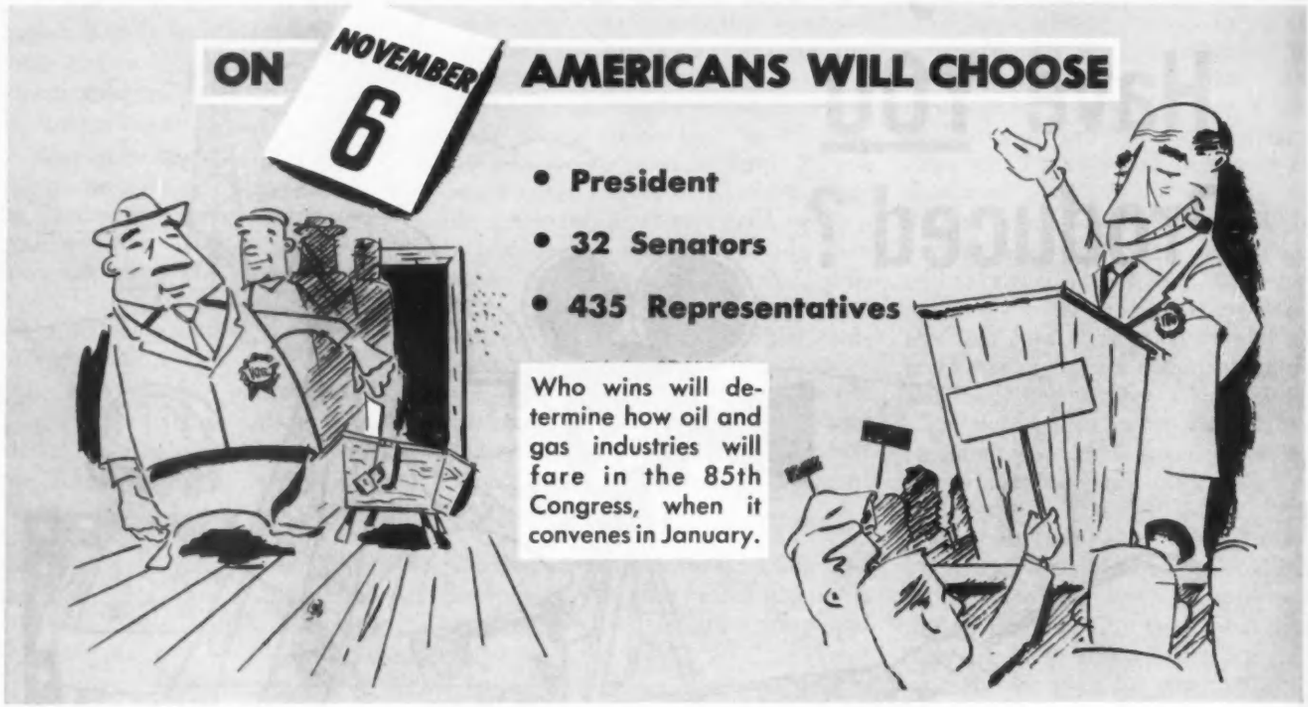

ON NOVEMBER 6 AMERICANS WILL CHOOSE
• President
• 32 Senators
• 435 Representatives
Who wins will determine how oil and gas industries will fare in the 85th Congress, when it convenes in January.

- **What to expect of re-elected office holders is revealed in past legislation.**
- **But future trends in Washington will be shaped by choice of a President and modified by election of some new members of Congress.**

By DON E. LAMBERT
World Oil Staff

Results of the general election November 6 will forecast how the oil and gas industries will fare in the 85th Congress when it convenes in January.

Attitudes of the incumbent President, senators, and representatives toward oil and gas matters have been publicly revealed in connection with past legislation. In so far as the incumbents are returned to office, a good idea of what to expect in future legislation is afforded. (The record for the past four years will be herewith briefly reviewed.)

But attitudes and actions in Washington will be modified in line with the people's choice of a president and their selection of new members of Congress.

The views and philosophies of the Republican and Democratic candidates for president are well known and are due to be even more plainly revealed. Oil and gas industry people can forecast the climate to be expected around the White House under either Eisenhower or Stevenson.

How new members of Congress will vote on oil and gas matters may be foreshadowed to some extent by their party affiliations. In some legislation it is to be expected that party lines will be followed. This will be true especially on matters covered specifically in the party platforms.

A number of matters of prime importance to oil and gas are sure to come before the new Congress.

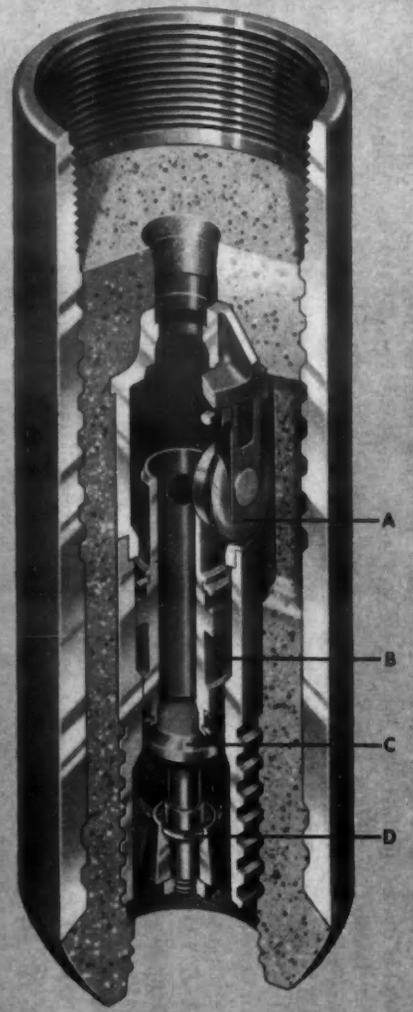
The roster of subjects may include these, among other matters, all of which are being pushed by one group or another:

- Efforts to cut the 27.5 percent depletion provision.
- A new natural gas bill.
- Bills to divorce retailing from refining.
- Moves to give gasoline dealers more power to sue their suppliers.
- Efforts to slow down mergers and trading in oil and gas leases.
- Curbs on military grabs of public lands.
- Navy plans to set up more oil reserves.
- Tax relief for foreign operations.
- Moves to prevent price discrimination in the oil industry.
- Moves to curtail oil imports.
- Aid for tanker construction growing out of the Suez crisis.
- Moves against the Interstate Oil Compact Commission.

These are just a few of the issues that will affect the oil industry. How Congress will vote on them is purely speculative.

Whether the donkey or the elephant reigns in Washington depends on the way voters cast their ballots for the 32 Senators and 435 Congressmen who will be elected in November.

Many of these legislators have expressed their feelings toward the oil



A Flapper Type Back-Pressure Valve activated at option of operator.

B Sleeve Valve } Control rate of flow and volume of fill-up fluid.

C Sleeve Valve Seat }

D When operator shears this Shear Ring (1,000 psi on casing), Flapper Valve is released to form a Back-Pressure Valve for floating or cementing.

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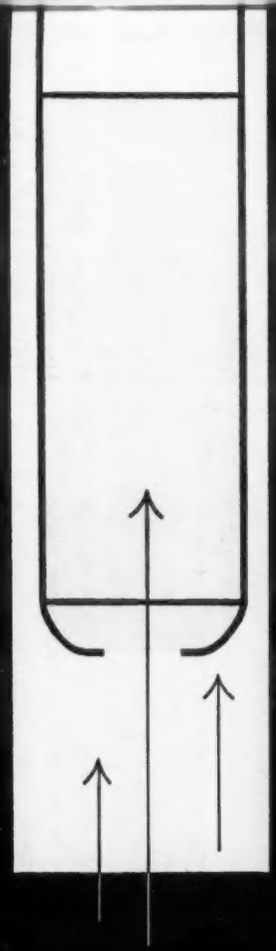
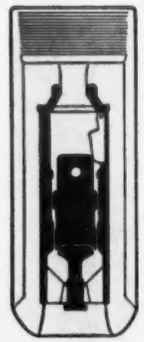


It fills casing from the bottom up

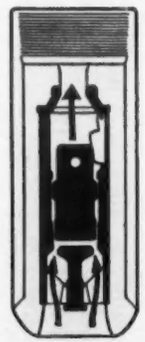
With Baker DIFFERENTIAL FILL-UP Shoes and Collars, casing is filled automatically from the bottom up, *while it is being run*... and because DIFFERENTIAL Equipment contains a Variable Valve *that opens and closes* to synchronize the rate of "fill" with the rate of lowering the casing, maximum reduction of destructive high-pressure surges is obtained.

This "controlled automatic fill" saves up to one-third of running-in time because... (a) time-wasting surface filling of casing is eliminated; and (b) casing can be run in at a faster speed, reducing the possibility of sticking, without causing destructive high-pressure surges. Pressure surges over 5000 psi can be created below casing equipped with floating equipment each time a joint is lowered. Damage caused by these high-pressure surges and the cost of this damage in bad cement jobs, lost circulation, and decreased production is becoming a matter of concern to many operators.

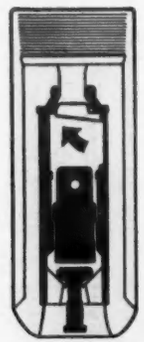
HOW DIFFERENTIAL EQUIPMENT WORKS



RUNNING-IN
Sleeve Valve in closed position



RUNNING-IN
Sleeve Valve in opened position



CEMENTING OR FLOATING
Flapper Valve released

Hydrostatic pressure of the "fill" acts on the upper pressure area of the sleeve valve. Hydrostatic pressure of the fluid in the annulus acts on the lower pressure area of the valve which is 90% of the upper pressure area. It is this differential in area that results in a "fill" of approximately 90% (shoe or collar), or 81% (shoe and collar) with respect to the fluid level of the annulus and gives the equipment its name. The valve opens and closes in accordance with the pressure differential across it to: (1) fill the casing automatically, (2) reduce pressure surges and (3) prevent overfill of the casing.

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industry by their stands on critical oil issues during past sessions of Congress. The best facts on record lie in roll call votes on bills affecting the oil industry.

A four-year history of those roll call votes is as follows:

Offshore Lands. First, there was offshore lands legislation in 1952. The legislation was design to confirm and establish state title to the offshore submerged lands. The Senate voted for this bill, widely supported by officials of states and many oil executives, on April 2, 1952. The vote was 50 to 35. The House voted for it May 15, 1952 by 247 to 89. On May 29, President Truman vetoed the measure.

Offshore Submerged Lands. Second, there was an offshore submerged lands bill, sponsored by the Eisenhower administration in 1953. The measure, to give the states title to the inner belt and the federal government the outer belt, passed the House April 1, 1953. The vote was 285 to 108.

The Senate passed a companion measure May 5, 1953. The vote was 56 to 35. President Eisenhower signed the measure, making it law. That ended one of the longest major legislative fights in recent decades in Washington.

Hinshaw Bill. Third, there was the so-called Hinshaw bill to remove federal controls over natural gas distributing companies, if the states exercise control. The House passed it July 30, 1953, by a voice vote. Thus, there was no roll call. The Senate waited until the next year, March 15, 1954, to pass the measure. Only roll call vote came on a motion to recommit the measure. The motion was rejected by 25 to 52. The measure was sent to the White House, and signed into law by the President on March 27, 1954.

Natural Gas Bill. Fourth came the natural gas bill to remove, or ease federal price and other controls over independent producers of gas. Backed by a Cabinet committee, the measure came to a vote in the House on July 28, 1955. The vote was 209 to 203, a bare majority.

The Senate waited before it passed an identical measure on Feb. 6, 1956, by a vote of 53 to 38. President Eisenhower vetoed it, just as President Truman had vetoed a similar measure some years earlier.

The presidents had different reasons for their vetoes. President Truman preferred controls to protect the consumers. President Eisenhower preferred easing the controls, to encourage free enterprise and, more supply for consumers. But he objected to "tactics" use in behalf of the gas bill.

Synthetic Rubber. Fifth, there was the synthetic rubber plant legislation. After years of flirting with the subject, the Congress finally got around to selling the government's wartime synthetic rubber plants to private industry. Oil companies are among the buyers of the plants.

The House voted for legislation to authorize the government to start selling the plants. The measure was passed June 25, 1953. A motion to recommit the measure was defeated 58 to 316. The Senate voted for a bill July 21, 1953, by 65 to 16, after adding power for Congress to veto any or all sales later on.

Sale of Rubber Plants. Sixth, there was the actual sale of rubber plants. A motion to block the sales came before the House, and was rejected on March 23, 1955, by 137 to 276. In the Senate, a similar motion was turned down by 31 to 56. So, the plants are now in the hands of private industry.

Oil Imports. Finally, there was the matter of oil imports, about which the industry, as well as the legislators, is split.

During 1953, the so-called "second Simpson" bill reached the House floor for a vote; it was a measure designed to give more protection to U. S. crude oil, lead and zinc producers, and to protect other U. S. industries against competition from imports. For oil, it provided imports of crude and products would be limited to 10 percent of domestic demand. The House voted to recommit the bill, thus killing it, by 242 to 161 on July 23, 1953.

These are the records on which oil industry people can express their opinions at the polls next November. To a great extent, the action of voters will determine the way oil will fare in the forthcoming 85th Congress.

—**The End**

Must File Forms to Hold Down Partnership Operation Taxes

THE INTERNAL REVENUE DEPARTMENT has issued instructions to operators of oil properties that they must file certain information with the Treasury Department or face the disallowance of the deduction of intangible development costs. They would then be required to capitalize these expenses.

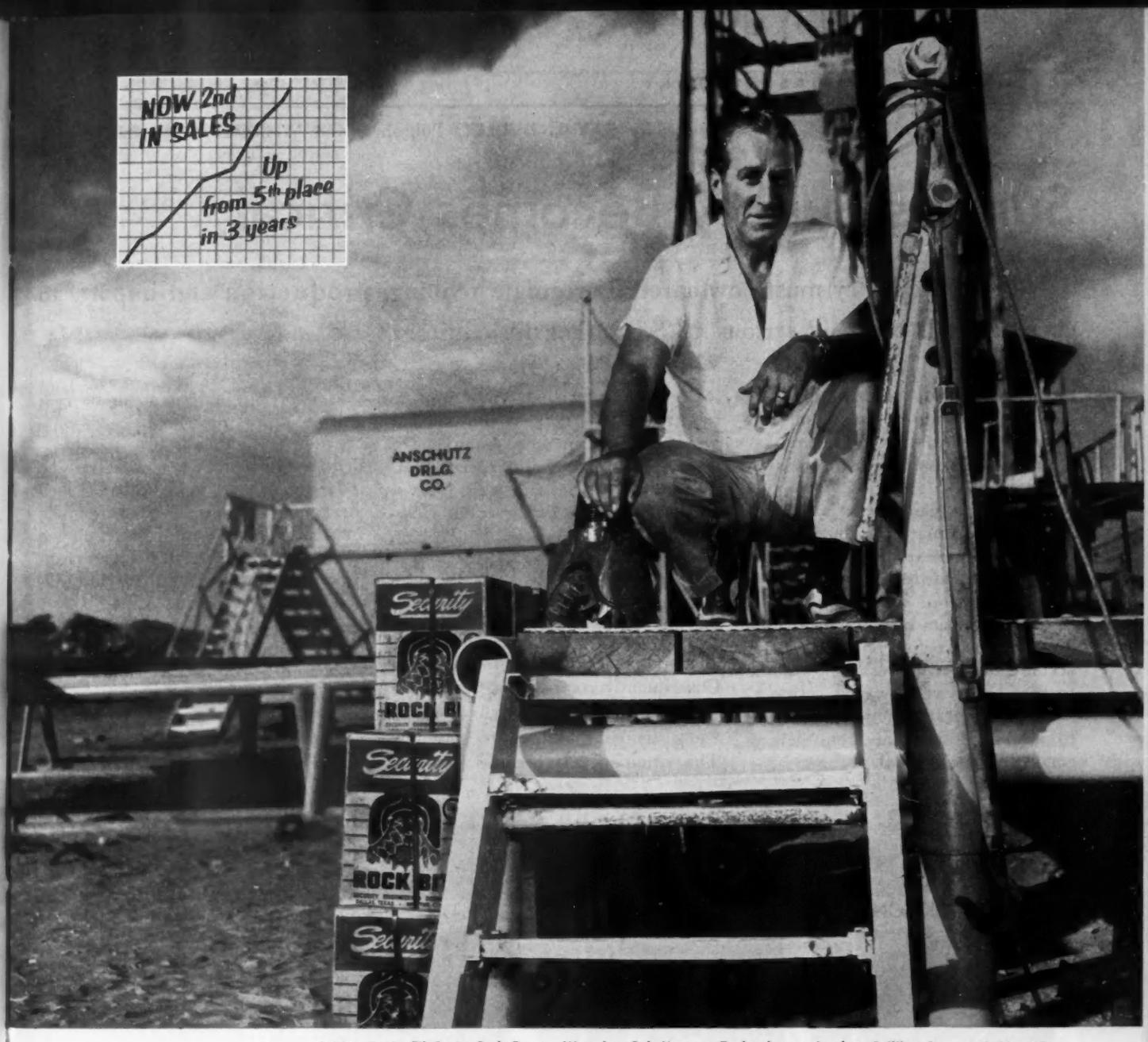
This new ruling applies to all operators who have, or will have, any type of joint interest or co-ownership since Dec. 31, 1954, in connection with the ownership, drilling, development, operation, payment of lease rentals, etc., of oil and gas leases.

Those operators who have such operations must do the following *before Oct. 15, 1956:*

1. The operating co-owner should file Form 1065 for each separate venture, which return must include:
   (a) A statement that the group engaged in the venture qualifies under Subdivision (111) of Section 1, 761 - 1 (a) (2) and elects to be excluded from all of Subchapter K of the 1954 Internal Revenue Code. (Partnerships).
   (b) Names and addresses of all co-owners during the year 1955.
   (c) Brief description of the property.
   (d) A copy of the Operating Agreement, or if there is no written agreement, a summary of the Oral Agreement.

2. An information return, Form 1099, must be filed for each deal with the Commissioner of Internal Revenue in the operator's respective Internal Revenue Department Center. A Form 1099 is required for each person who is a member of the organization (the operating partnership) during any part of the calendar year. Such form should show under "To Whom Paid" the name and address of the member and under "By Whom Paid" the name and address of the organization. In lieu of "Kind and Amount of Income Paid" each Form shall state "Filed Under Section 761 (a)" and the principal activity of the organization.

—**The End**



Drilling in the Elk Basin, Park County, Wyoming, Bob Mangan, Toolpusher on Anschutz Drilling Company's Rig #7, proved to himself the superior performance of SECURITY rock bits by testing them against other leading bits.

TYPE FOR TYPE—SECURITY BITS PROVED BEST!

"Security Rock Bits have proved themselves better than any other bits I've used," says Bob Mangan, Toolpusher on Anschutz Drilling Company's Rig #7. "We recently compared *Security* with competitive bits on several Rocky Mountain locations. Type for type and size, *Security* dug faster, averaged more hole per bit, and came out looking better."

In the highly competitive oil well drilling industry, a little extra footage per bit — plus slightly greater penetration rate — can mean the difference between profit and loss. That's why progressive toolpushers like Bob Mangan test and compare leading brands of bits. They know you can't afford to be guided solely by tradition in the choice of rock bits. After all, the proof of rock bit performance is in the digging — not how long it has been on the market.

If your business is drilling oil wells — and you aren't already using *Security* bits — you owe it to your balance sheet to try *Security* on your next location. Give *Security* a fair trial on one hole, and you, too, will be convinced that *nothing outdigs Security*. Write for catalog.

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By **RAY L. DUDLEY,** Publisher, and **WARREN L. BAKER,** Editor

Surplus Supply Becomes Critical

Industry must now carefully regulate refining, production and imports to current needs to avoid serious U. S. market difficulties.

Serious market troubles face the U. S. oil industry. Gasoline supplies have been permitted to become far too excessive, despite record consumption.

The winter season now is so close at hand, the situation cannot be corrected before next spring. The off-consuming motor fuel winter season is being entered with substantially greater quantities of gasoline in storage than ever before. Normal winter accumulations will push the volume to very high levels by next spring.

Drastic corrective action is required to keep the situation from getting completely out of hand.

It is necessary that crude runs to refinery stills be reduced and kept at low levels for sometime. A number of large refiners have announced plans to curtail their runs to stills. This is a move in the right direction. However, it is unfortunate that this action did not come much sooner. Other refiners should follow suit.

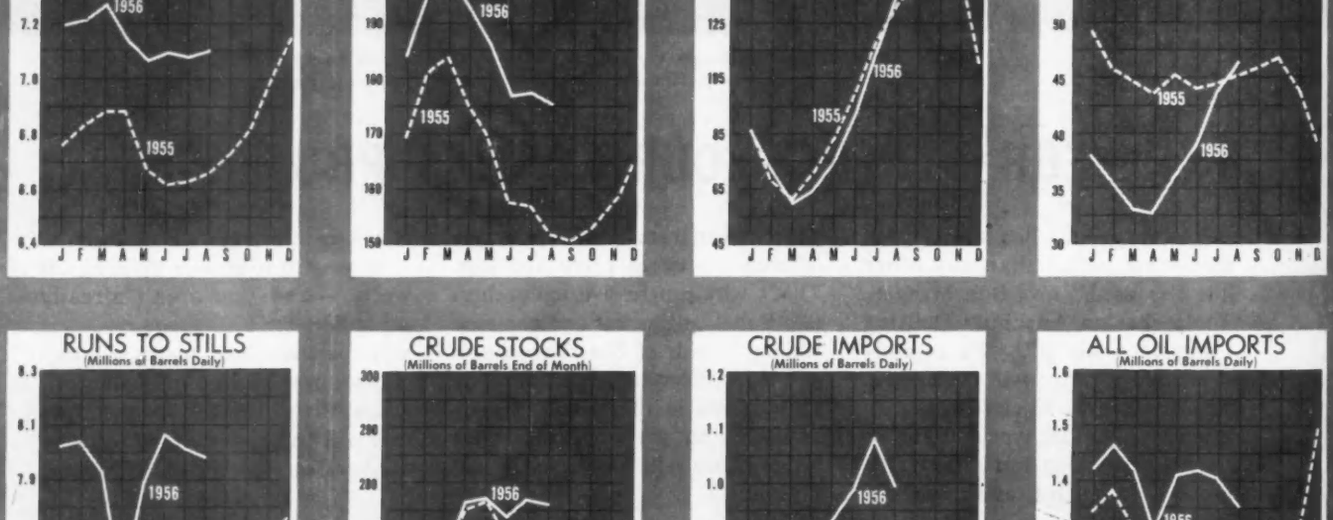
The situation is made more difficult because of the need to manufacture enough heating oils to satisfy demand. Consequently, refiners must also adjust yields of distillate fuels upwards while reducing output of gasoline. The situation has become so acute that very careful balancing of runs and yields are called for.

•

Crude oil producers will feel the influence of the unfavorable refined market conditions. Reduced crude runs to refinery stills will lessen the demand for crude oil. This means producers cannot anticipate any sizeable increases in production.

Soft gasoline prices will keep the crude oil market in a weakened state. Reports of gasoline price shadings are heard with increasing frequency. Any break in the posted price of gasoline would put crude oil markets in a precarious position.

Petroleum Trends . . .



The difficulty springs from the manufacture of too much motor fuel during heavy consuming summer months.

Despite record gasoline consumption, only 22 million barrels of motor fuel have been taken from U. S. inventories since the end of March. During 1955, stocks of gasoline were reduced by nearly 34 million barrels between the end of March and the end of September.

Consequently, the industry is entering the winter months with approximately 177 million barrels of gasoline in U. S. storage tanks. This is 25 million barrels more than existed a year ago. This is an increase of 16 percent. In contrast demand has been only 5 percent above last year.

Unless refiners do a remarkable job of curtailing the output of gasoline, winter accumulations may push this total to something like 225 million barrels before next spring. This is a lot of gasoline. Not only will it have a depressing influence on gasoline prices, but it will cost the industry a lot of money to carry this much inventory.

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The only way to reduce such a huge volume to a satisfactory level is to keep crude runs and output within reasonable limits this winter and next summer. This means runs cannot exceed year ago levels by any great margin, despite higher consumption.

Such action would call for U. S. production and imports to be held close to year ago levels also. Otherwise, the now favorably balanced crude oil supply situation would get out of hand.

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This is a long term problem. Oversupply has become a chronic situation for the U. S. industry. Each year it seems to become a little worse.

Competition has resulted in producing and refining ability increasing more rapidly than consumption, although the latter has been growing by substantial margins. Increased production abroad has added to the problem.

The industry is going to have to learn to live with this situation.

This will call for the proper regulation of refining, producing and import rates. Failure of any one of these phases to be properly regulated would wreck the stability of the industry's markets.

U. S. Crude Oil and Refined Product Trends

(THOUSANDS OF BARRELS)

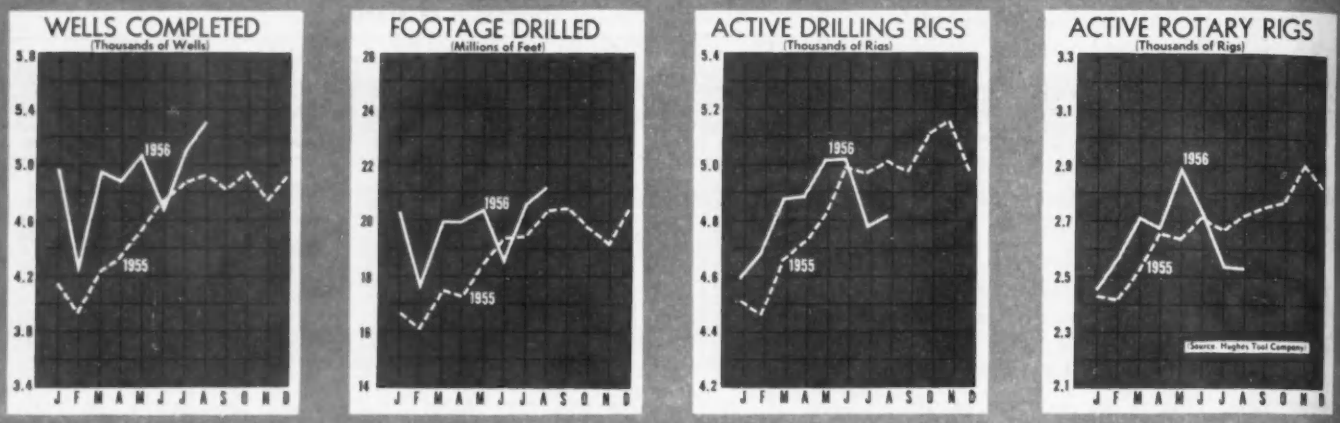
MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL		DAILY IMPORTS	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Crude Oil	Total Oils
1955:											
January	6,761	7,379	260,156	3,639	169,562	1,740	86,692	1,235	49,457	739	1,348
February	6,835	7,549	258,630	3,655	181,643	1,847	68,513	1,239	46,042	751	1,379
March	6,886	7,374	264,430	3,543	183,972	1,703	62,457	1,185	44,970	742	1,319
April	6,887	7,136	275,232	3,502	175,601	1,534	70,139	1,110	43,838	697	1,123
May	6,677	7,281	276,948	3,605	168,751	1,519	83,559	1,111	45,083	742	1,137
June	6,613	7,484	270,850	3,725	157,439	1,628	100,652	1,080	44,398	764	1,159
July	6,632	7,580	264,601	3,824	157,079	1,575	119,169	1,091	44,894	860	1,161
August	6,665	7,580	256,427	3,858	151,912	1,621	133,675	1,090	45,480	756	1,155
September	6,731	7,483	256,269	3,784	150,194	1,621	143,248	1,061	46,267	829	1,218
October	6,831	7,465	267,346	3,827	153,103	1,612	152,288	1,123	47,040	821	1,206
November	7,014	7,692	260,707	3,867	157,871	1,680	141,808	1,214	44,071	823	1,322
December	7,155	7,762	265,610	3,916	165,433	1,765	111,333	1,286	39,174	884	1,502
1956:											
January	7,199	8,023	261,592	3,927	183,905	1,923	86,141	1,344	38,247	805	1,422
February	7,208	8,047	259,504	3,854	196,092	1,918	71,335	1,286	35,673	878	1,472
March	7,278	7,914	265,683	3,829	199,698	1,808	60,846	1,213	32,984	934	1,425
April	7,146	7,487	277,121	3,646	193,299	1,713	63,571	1,130	32,740	815	1,305
May	7,064	7,896	277,497	3,859	186,673	1,667	75,928	1,149	36,607	938	1,416
June	7,100	8,071	274,491	3,976	177,076	1,755	93,758	1,098	39,073	987	1,426
July	7,088	8,011	277,546	3,895	177,416	1,808	117,664	1,105	44,189	1,081	1,408
August	7,105	7,987	277,166	3,953	175,625	1,832	139,060	1,123	46,842	992	1,353
Week Ended:											
9-14-56	7,049	8,078	275,253	3,932	175,767	1,809	146,105	1,107	48,276	1,101	1,494
9-16-55	6,684	7,471	255,463	3,708	152,165	1,643	141,229	1,049	46,700	776	1,114

U. S. Crude Production

(THOUSANDS OF BARRELS)

STATE or DISTRICT	DAILY AVERAGE PRODUCTION				TOTAL PRODUCTION		
	August, 1956	July, 1956	August, 1955	% Diff. August, 1956-1955	1956	1955	% Diff. 1956-1955
Alabama	7.6	6.9	3.7	+105.4	1,573	892	+ 76.3
Arkansas	77.9	75.9	77.3	+ 0.8	18,993	19,010	— 0.1
California	960.3	958.3	976.1	— 1.6	235,411	236,155	— 0.3
Colorado	158.7	164.5	148.9	+ 6.6	39,565	32,524	+ 21.6
Florida	1.3	1.3	1.5	— 13.3	326	324	+ 0.6
Illinois	231.0	228.6	229.2	+ 0.8	55,293	53,824	+ 2.7
Indiana	31.0	31.4	31.9	— 2.8	7,229	7,351	— 1.7
Kansas	342.4	343.5	334.4	+ 2.4	83,374	81,017	+ 2.9
Kentucky	47.5	48.1	44.0	+ 8.2	11,094	9,924	+ 17.8
Louisiana	788.9	786.2	724.5	+ 8.9	195,714	174,571	+ 12.1
North Louisiana	122.4	122.6	120.0	+ 2.0	30,744	28,840	+ 6.6
South Louisiana	666.5	663.6	640.5	+ 4.1	164,970	145,731	+ 13.2
Michigan	28.3	28.4	31.3	— 9.6	7,286	7,597	— 4.1
Mississippi	112.5	111.7	104.5	+ 7.8	27,069	23,837	+ 13.6
Missouri	0.2	0.2	0.2	.....	40	45	— 11.1
Montana	64.1	63.5	41.9	+ 53.0	14,231	10,489	+ 35.7
Nebraska	38.2	38.9	27.9	+ 37.0	10,039	6,040	+ 66.2
Nevada	0.2	0.2	0.1	+100.0	49	45	+ 8.9
New Mexico	233.1	235.9	226.5	+ 2.9	57,882	53,975	+ 7.2
Southeast New Mexico	231.3	234.1	223.5	+ 3.5	57,163	53,285	+ 7.3
Northwest New Mexico	1.8	1.8	3.0	— 40.0	719	690	+ 4.2
New York	10.2	10.2	8.5	+ 20.0	2,005	1,966	+ 2.0
North Dakota	35.1	35.0	33.5	+ 5.1	8,712	7,095	+ 22.8
Ohio	13.1	13.5	13.0	+ 0.8	3,121	2,810	+ 11.1
Oklahoma	578.5	585.0	548.7	+ 5.4	145,046	133,388	+ 8.7
Pennsylvania	20.2	20.1	24.3	— 16.5	5,324	5,626	— 5.4
South Dakota	0.1	0.1	.....	.....	21	24	— 12.5
Tennessee	0.1	0.1	.....	.....	10	12	— 16.7
Texas	3,023.8	3,002.7	2,737.0	+ 10.5	741,533	700,735	+ 5.8
Dist. 1—South Central	56.4	56.4	49.3	+ 14.4	13,240	12,380	+ 6.9
Dist. 2—Middle Gulf	153.2	154.4	141.7	+ 8.2	38,410	36,573	+ 5.0
Dist. 3—Upper Gulf	457.9	457.3	433.0	+ 5.8	111,144	110,963	+ 0.2
Dist. 4—Lower Gulf-S.W.	244.4	239.8	230.2	+ 6.2	59,820	59,488	+ 0.6
Dist. 5—East Central	43.3	44.2	47.9	— 9.6	11,093	11,652	— 4.8
Dist. 6—Northeast	340.1	339.0	322.1	+ 5.6	84,295	84,170	+ 0.1
Dist. 7-B—North Central	158.0	156.2	143.0	+ 10.5	38,104	34,265	+ 11.2
Dist. 7-C—West Central	193.1	186.2	173.6	+ 11.2	45,372	45,176	+ 0.4
Dist. 8—West	1,060.2	1,056.4	908.2	+ 16.7	255,339	228,023	+ 12.0
Dist. 9—North	217.1	215.4	195.1	+ 11.3	51,497	48,180	+ 6.9
Dist. 10—Panhandle	100.1	97.4	89.9	+ 11.3	23,225	21,325	+ 8.9
Utah	6.6	4.9	6.1	+ 8.2	1,258	1,391	— 9.6
Virginia	0.1	0.1	.....	.....	11	8	+ 37.5
West Virginia	6.0	6.0	6.5	— 7.7	1,467	1,574	— 6.8
Wyoming	288.4	286.8	283.1	+ 1.9	69,891	66,373	+ 5.3
TOTAL UNITED STATES	7,105.4	7,088.0	6,664.6	+ 6.6	1,744,167	1,638,622	+ 6.4

Drilling Activity . . .



August's Wells Hit New Peak

Year's tests boosted to 9.6% lead over 1955, but active rigs are not yet back to pre-strike level.

On basis of wells completed, August's drilling activity was the greatest ever attained in a single month. The previous record had been set a month earlier, but August's new high topped that by 223 wells or more than 4 percent.

The reason for qualifying August's peak activity to its completed wells is that actual drilling was probably somewhat lessened, for the number of drilling rigs active during the month had been substantially lowered since the recent steel strike. However, by the end of the month some of the idled rigs began to reappear in the active columns.

August's new all-time high amounted to 5344 new wells completed, while the previous peak had been July's 5121. August's wells were also 7.2 percent greater in number than the 4984 recorded in August of last year. However, there were 200 fewer drilling rigs active at the end of August than were at work a year earlier.

The month's large number of wells pushed the year's eight-months' total to 39,359 new wells, and that represented a gain of 9.6 percent over the 35,907 drilled in the comparable period of 1955. However, footage drilled has not quite kept the pace. At the end of eight months, total footage held a lead of 9.3 percent over last year's, while wells had a 9.6 percent margin.

There has been a considerable decline in the success of this year's drilling as compared with last year's. Wells drilled as commercial producers in the first eight months totaled 24,026, which amounted to 62.0 percent of all wells drilled in search of oil and gas. At the same point in 1955, producing wells totaled 22,619, but they amounted to 65.6 percent of the total.

Wildcat Drilling Up. The month also saw a new record number of wildcats completed. The previous monthly peak had been 1163 wildcats completed in July, but August's 1198 goes into the books as the new high.

Through August, 8357 wildcats were completed in the U. S. That represented a gain of 13.4 percent over the 7370 drilled during the same period of 1955. Despite the increase in wildcat activity, this year's results have not matched 1955's. To date, 961 tests have been rated as discoveries, while a year ago the count had been 976. This year's additional 987 wildcat tries all resulted in failures.

At the end of August, there were 4819 drilling rigs active in the U. S. That was a small gain from the 4775 working a month earlier, but it was still substantially below the 5019 drilling prior to the steel strike.

Summary of U. S. Wildcat Drilling

ITEM	Aug., 1956	July, 1956	EIGHT MONTHS January-August 1956	1955	Percent Diff.
New Field Discoveries:					
Oil	108	98	732	738	— 0.8
Distillate	18	6	76	88	—13.6
Gas	30	12	153	150	+ 2.0
Total Discoveries	156	116	961	976	— 1.5
Dry Wildcats	1,042	1,047	7,396	6,394	+14.3
Total Wildcats	1,198	1,163	8,357	7,370	+13.4
Percent Productive	13.0	10.0	11.5	13.2	.....
Percent Dry	87.0	90.0	88.5	86.8	.....

(See Page 134 for details)

Summary of U. S. Drilling Activity

ITEM	Aug., 1956	July, 1956	EIGHT MONTHS January-August 1956	1955	Percent Diff.
New Wells Completed:					
Oil	2,779	2,737	21,019	19,976	+ 5.2
Distillate	74	38	385	542	—29.0
Gas	359	327	2,662	2,101	+26.8
Service	81	76	616	433	+42.3
Dry	2,051	1,943	14,717	12,855	+14.5
Total Wells	5,344	5,121	39,359	35,907	+ 9.6
Footage Drilled (Mln. of Feet)	21.3	20.8	159.6	146.0	+ 9.3

(See Page 134 for details)

He's shooting for perfection

This earnest young man is intent on turning out a perfect sheave. From the looks of the job, we'd say his chances are fine. Best-looking sheave wheel we've seen in quite a while.

He has done his machining with great care, and with complete confidence. That confidence is warranted, for the wheel was first a Bethlehem steel blank, made by Bethlehem's forging-and-rolling process.

If you've never seen this method of manufacture, let us explain it briefly. It employs a mill that is the only one of its kind in the entire country. Blanks are not just forged, not just rolled, but *both* — in a single operation that produces high strength and very desirable grain flow.

That high strength is important. Equally important is the way the blanks machine. In the customer's shop, machinists can do their job with assurance, knowing that the metal underneath is as firm and "sweet" as that on top.

Bethlehem forged-and-rolled blanks are available for a long list of applications, including spur, bevel, miter, and other types of gears; crane and sheave wheels; turbine rotors, clutch drums, brake drums, flywheels, pipe flanges, and numerous others. You can obtain the blanks in sizes from 10 to 42 in. OD, untreated or heat-treated. For full details, ask for Booklet 216; it will be sent to you promptly.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
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BETHLEHEM STEEL

U. S. Drilling Activity in August and First Eight Months, 1956-1955

STATE or DISTRICT	TOTAL NEW WELLS COMPLETED AND FOOTAGE DRILLED: DETAILS FOR AUGUST, 1956 — Oil	Dist.	Gas	Dry	Service Wells	TOTAL NEW WELLS — Aug. 1956	July 1956	Aug. 1955	Total Footage Aug. 1956	DETAILS FOR JANUARY-AUGUST — NEW WELLS — 1956	1955	Percent Diff.	FOOTAGE — 1956	1955	WILDCAT DRILLING IN AUGUST AND FIRST EIGHT MONTHS, 1956-1955 — DETAILS FOR AUGUST, 1956 — Oil	Distillate	Gas	Dry	Total Wildcats	DETAILS FOR JANUARY-AUGUST — Oil	Distillate	Gas	Dry	TOTAL WILDCATS — 1956	1955	DRILLING RIGS IN OPERATION — Aug. 31 1956	July 31 1956	Aug. 31 1955
Alabama	5			2		7	10	4	67,642	63	34	+ 85.3	512,565	141,995				1	1			1	18	19	32	14	15	6
Arizona			2	1		3	4		18,048	7	4	+ 75.0	22,048	16,136				2	1	3			2	5	7	4	1	3	1
Arkansas	67			33		100	91	82	285,385	598	495	+ 20.8	1,852,075	1,633,401					12	12	9		3	86	98	100	67	56	63
California	146		6	48		200	184	199	887,825	1,445	1,585	— 8.8	6,778,687	7,818,520				1	29	30	6		5	170	181	222	194	184	240
Colorado	15		6	77		98	99	133	472,213	848	991	— 14.5	4,418,063	5,297,426	1				61	62	18	1	6	407	432	548	79	70	111
Florida				1		1	1	1	4,016	8	21	— 61.9	43,137	134,079					1	1				8	8	20	2	1	4
Georgia							2			5			22,008											5	5		1		1
Idaho										1	3	— 66.7	4,528	11,337										1	1	3	2	1	
Illinois	143		9	163		315	365	317	649,852	2,466	2,442	+ 1.0	5,714,741	5,894,781	1				85	86	14		1	637	652	450	279	302	348
Indiana	36			48	1	85	61	57	134,820	449	405	+ 10.9	773,153	606,473	1				13	14	2			110	112	133	90	85	101
Kansas	140		33	179	9	361	382	351	1,281,715	3,106	3,052	+ 1.8	10,953,754	11,109,961	14			7	90	111	114		23	697	834	730	509	486	494
Kentucky	83		18	97		198	186	166	300,032	1,241	1,055	+ 17.6	1,816,405	1,673,393	1				15	16	4			106	110	80	124	136	131
Louisiana	135	23	27	118		303	356	346	2,221,186	2,439	2,695	— 9.5	18,110,825	17,301,549		5	1	49	55		26	24	14	356	420	354	403	413	414
North Louisiana	80	2	15	50		147	173	161	553,681	1,030	1,370	— 24.8	3,759,842	4,076,665			1	20	21		5	1	2	132	140	126	79	79	95
South Louisiana	55	21	12	68		156	183	185	1,667,505	1,409	1,325	+ 6.3	14,350,983	13,224,884		5		29	34		21	23	12	224	280	228	324	334	319
* Gulf of Mexico	12	2	3	8		25	31	26	238,841	242	203	+ 19.2	2,218,790	1,897,280				9	9		2	5	4	37	48	34	54	62	38
Maryland							4			4			30,716														1		2
Michigan	15		1	17		33	36	52	97,028	304	337	— 9.8	864,876	1,001,492	1			1	14	16	4		1	104	109	136	69	71	95
Mississippi	11	1		26		38	38	24	262,895	286	300	— 4.7	2,061,261	2,244,465	1				17	18	7	2		115	124	114	37	33	42
Missouri							4			21	24	— 12.5	23,811	13,095										15	15	17	1	1	5
Montana	29			40		69	50	46	340,512	314	213	+ 47.4	1,562,795	1,066,868	1				33	34	6		2	113	121	83	54	64	55
Nebraska	25			47		72	84	79	422,179	668	524	+ 27.5	3,861,580	3,038,956	3				31	34	31			295	326	232	28	31	56
Nevada							2			5	6	— 16.7	28,571	44,828										3	3	4	3	3	1
New Mexico	81	2	65	48		196	200	112	849,168	1,343	1,095	+ 22.6	5,997,337	4,680,916	3				33	36	28	1	1	152	182	138	184	190	147
New York	34				21	55	44	40	76,750	296	232	+ 27.6	414,850	320,568													74	65	56
North Dakota	11			1		12	30	24	100,148	181	160	+ 13.1	1,356,447	1,137,330					4	4	9			50	59	36	26	27	26
Ohio	70		18	29		117	81	131	254,078	697	774	— 10.0	1,675,780	1,628,228										3	3	15	221	216	223
Oklahoma	378	3	32	247	9	669	666	751	2,369,707	5,455	5,049	+ 8.0	19,571,133	17,292,310	12	1	3	65	81		67	13	22	470	572	497	591	634	620
Oregon										1	1		12,880	7,101										1	1	1			1
Pennsylvania	34		27	4	35	100	71	69	248,379	563	484	+ 16.3	1,550,827	913,883												3	169	155	119
South Dakota				7		7	3	1	15,008	14	7	+100.0	57,721	38,299					7	7				14	14	7	3	2	3
Texas	1,275	44	67	757	6	2,149	1,935	1,871	9,344,416	15,376	12,971	+ 18.5	65,123,704	57,265,789	67	10	13	455	550		380	33	67	3,249	3,729	3,210	1,274	1,205	1,339
Dist. 1: South Central	114	3		64	2	183	187	136	456,192	1,419	1,159	+ 22.4	3,756,874	3,042,027	4	1		45	50		18	1	4	340	363	277	42	54	54
Dist. 2: Middle Gulf	24	9	7	33		73	60	87	417,717	560	544	+ 2.9	3,463,949	3,262,348	2	1		19	22		9	5	4	168	186	202	47	41	44
Dist. 3: Upper Gulf	67	10	8	63		148	175	150	1,036,454	1,216	1,187	+ 2.4	8,146,524	7,605,330	3	1		42	46		17	8	4	292	321	301	137	151	137
* Gulf of Mexico				1		1		1	9,900	5	9	— 44.5	49,988	90,917				1	1					4	4	4	4	6	3
Dist. 4: Lower Gulf-S.W.	41	14	9	54		118	133	124	632,322	989	913	+ 8.3	5,244,110	4,832,258	4	4	3	37	48		16	10	14	291	331	318	64	67	81
* Gulf of Mexico		1				1		1	8,264	7	9	— 22.2	68,987	85,801										1	1	2	2	2	3
Dist. 5: East Central	6			14		20	27	22	58,099	169	180	— 6.1	557,415	701,825				13	13					90	90	98	10	11	13
Dist. 6: Northeast	48	2	2	24		76	74	61	381,255	599	463	+ 29.4	3,159,164	2,534,991	1			12	13		10	1	2	142	155	130	85	67	57
Dist. 7-B: North Central	135		6	136		277	172	309	1,028,345	2,062	2,091	— 1.4	7,325,307	6,669,023	26		3	100	129		122		11	691	824	737	118	112	165
Dist. 7-C: West Central	112		2	51		165	106	115	724,692	907	817	+ 11.0	4,082,072	4,513,403	7			37	44		32		2	195	229	224	120	106	109
Dist. 8: West	415	1	2	71		489	432	459	2,580,246	2,945	2,542	+ 15.9	15,120,402	13,901,102	8	1		32	41		67	3	2	294	366	357	300	297	384
Dist. 9: North	201		7	234	4	446	426	319	1,370,062	3,545	2,428	+ 46.0	10,506,836	7,906,865	10		2	112	124		75		8	688	771	523	262	202	215
Dist. 10: Panhandle	112	5	24	13		154	143	89	659,032	965	647	+ 49.1	3,761,051	2,296,617	4	3	7	6	20		14	5	16	58	93	43	89	97	80
Utah	4		1	8		13	12	5	56,216	97	63	+ 54.0	453,679	291,964				8	8		2		2	61	65	49	28	33	24
Washington										1			7,493											1	1				
West Virginia	14		46	8		68	49	60	189,067	467	409	+ 14.2	1,234,741	1,061,843												19	190	185	188
Wyoming	28	1	1	45		75	71	63	328,776	590	476	+ 23.9	2,717,826	2,340,637		1		18	19		5	2	3	144	154	133	101	108	103
Total United States	2,779	74	359	2,051	81	5,344	5,121	4,984	21,277,061	39,359	35,907	+ 9.6	159,630,017	146,027,623	108	18	30	1,042	1,198		732	76	153	7,396	8,357	7,370	4,819	4,775	5,019
Total Western Canada	288		16	125		429	174	322	1,990,305	1,571	1,691	— 7.1	7,474,979	7,193,519													252	230	220

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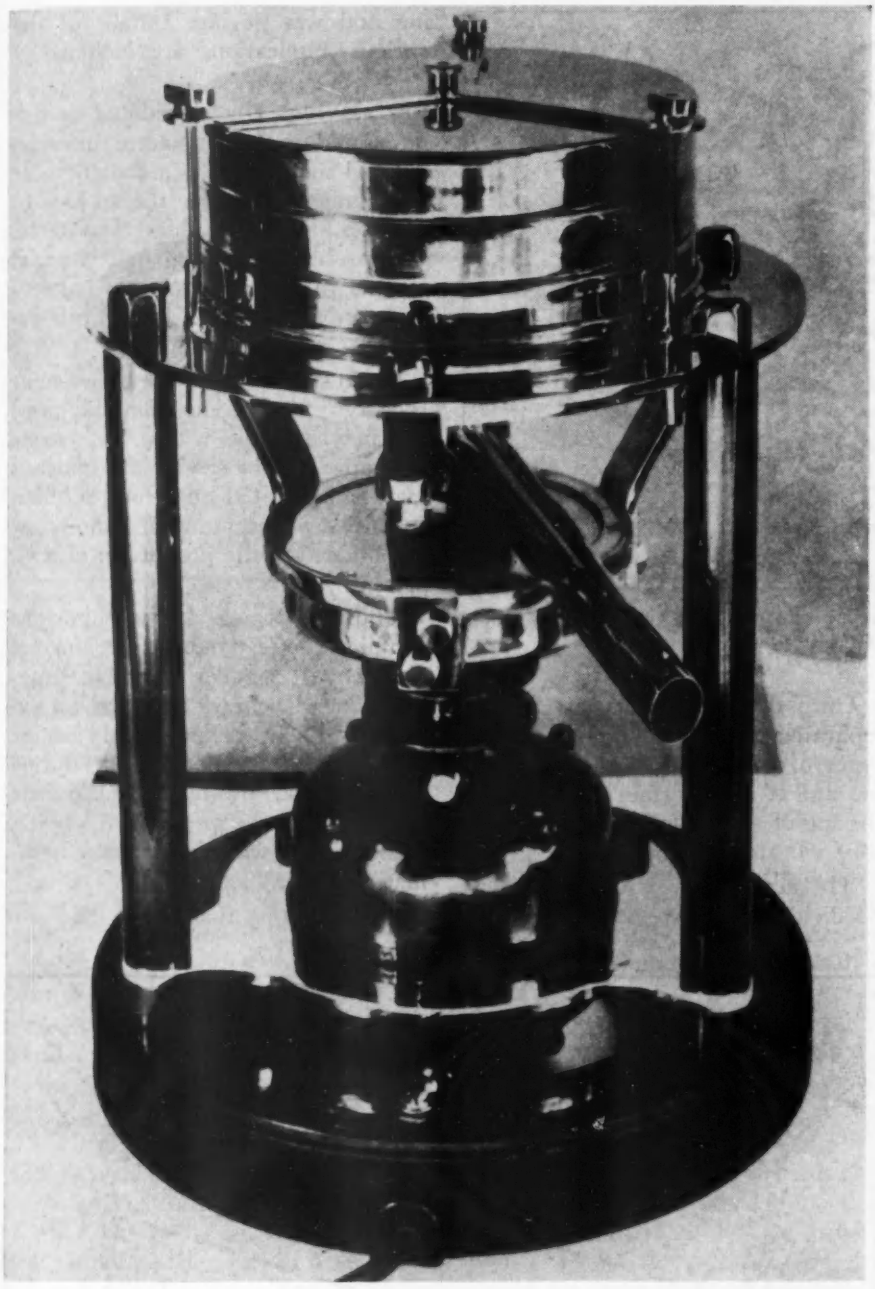

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U. S. Drilling Activity in August and First Eight Months, 1956-1955

STATE or DISTRICT	TOTAL NEW WELLS COMPLETED AND FOOTAGE DRILLED: DETAILS FOR AUGUST, 1956 — Oil	Dist.	Gas	Dry	Service Wells	TOTAL NEW WELLS — Aug. 1956	July 1956	Aug. 1955	Total Footage Aug. 1956	DETAILS FOR JANUARY-AUGUST — NEW WELLS — 1956	1955	Percent Diff.	FOOTAGE — 1956	1955	WILDCAT DRILLING IN AUGUST AND FIRST EIGHT MONTHS, 1956-1955 — DETAILS FOR AUGUST, 1956 — Oil	Distillate	Gas	Dry	Total Wildcats	DETAILS FOR JANUARY-AUGUST — Oil	Distillate	Gas	Dry	TOTAL WILDCATS — 1956	1955	DRILLING RIGS IN OPERATION — Aug. 31 1956	July 31 1956	Aug. 31 1955
Alabama	5			2		7	10	4	67,642	63	34	+ 85.3	512,565	141,995				1	1				19	32	14	15	6
Arizona			2	1		3	4		18,048	7	4	+ 75.0	22,048	16,136			2	1	3			1	5	7	4	1	3	1
Arkansas	67			33		100	91	82	285,385	598	495	+ 20.8	1,852,075	1,633,401				12	12	9		3	86	98	100	67	56	63
California	146		6	48		200	184	199	887,825	1,445	1,585	— 8.8	6,778,687	7,818,520			1	29	30	6		5	170	181	222	194	184	240
Colorado	15		6	77		98	99	133	472,213	848	991	— 14.5	4,418,063	5,297,426	1			61	62	18	1	6	407	432	548	79	70	111
Florida				1		1	1	1	4,016	8	21	— 61.9	43,137	134,079				1	1				8	8	20	2	1	4
Georgia							2			5			22,008										5	5		1		1
Idaho										1	3	— 66.7	4,528	11,337									1	1	3	2	1	
Illinois	143		9	163		315	365	317	649,852	2,466	2,442	+ 1.0	5,714,741	5,894,781	1			85	86	14		1	637	652	450	279	302	348
Indiana	36			48	1	85	61	57	134,820	449	405	+ 10.9	773,153	606,473	1			13	14	2			110	112	133	90	85	101
Kansas	140		33	179	9	361	382	351	1,281,715	3,106	3,052	+ 1.8	10,953,754	11,109,961	14		7	90	111	114		23	697	834	730	509	486	494
Kentucky	83		18	97		198	186	166	300,032	1,241	1,055	+ 17.6	1,816,405	1,673,393	1			15	16	4			106	110	80	124	136	131
Louisiana	135	23	27	118		303	356	346	2,221,186	2,439	2,695	— 9.5	18,110,825	17,301,549		5	1	49	55	26	24	14	356	420	354	403	413	414
North Louisiana	80	2	15	50		147	173	161	553,681	1,030	1,370	— 24.8	3,759,842	4,076,665			1	20	21	5	1	2	132	140	126	79	79	95
South Louisiana	55	21	12	68		156	183	185	1,667,505	1,409	1,325	+ 6.3	14,350,983	13,224,884		5		29	34	21	23	12	224	280	228	324	334	319
* Gulf of Mexico	12	2	3	8		25	31	26	238,841	242	203	+ 19.2	2,218,790	1,897,280				9	9	2	5	4	37	48	34	54	62	38
Maryland							4			4			30,716													1		2
Michigan	15		1	17		33	36	52	97,028	304	337	— 9.8	864,876	1,001,492	1		1	14	16	4		1	104	109	136	69	71	95
Mississippi	11	1		26		38	38	24	262,895	286	300	— 4.7	2,061,261	2,244,465	1			17	18	7	2		115	124	114	37	33	42
Missouri							4			21	24	— 12.5	23,811	13,095									15	15	17	1	1	5
Montana	29			40		69	50	46	340,512	314	213	+ 47.4	1,562,795	1,066,868	1			33	34	6		2	113	121	83	54	64	55
Nebraska	25			47		72	84	79	422,179	668	524	+ 27.5	3,861,580	3,038,956	3			31	34	31			295	326	232	28	31	56
Nevada							2			5	6	— 16.7	28,571	44,828									3	3	4	3	3	1
New Mexico	81	2	65	48		196	200	112	849,168	1,343	1,095	+ 22.6	5,997,337	4,680,916	3			33	36	28	1	1	152	182	138	184	190	147
New York	34				21	55	44	40	76,750	296	232	+ 27.6	414,850	320,568												74	65	56
North Dakota	11			1		12	30	24	100,148	181	160	+ 13.1	1,356,447	1,137,330				4	4	9			50	59	36	26	27	26
Ohio	70		18	29		117	81	131	254,078	697	774	— 10.0	1,675,780	1,628,228									3	3	15	221	216	223
Oklahoma	378	3	32	247	9	669	666	751	2,369,707	5,455	5,049	+ 8.0	19,571,133	17,292,310	12	1	3	65	81	67	13	22	470	572	497	591	634	620
Oregon										1	1		12,880	7,101									1	1	1			1
Pennsylvania	34		27	4	35	100	71	69	248,379	563	484	+ 16.3	1,550,827	913,883											3	169	155	119
South Dakota				7		7	3	1	15,008	14	7	+100.0	57,721	38,299				7	7				14	14	7	3	2	3
Texas	1,275	44	67	757	6	2,149	1,935	1,871	9,344,416	15,376	12,971	+ 18.5	65,123,704	57,265,789	67	10	13	455	550	380	33	67	3,249	3,729	3,210	1,274	1,205	1,339
Dist. 1: South Central	114	3		64	2	183	187	136	456,192	1,419	1,159	+ 22.4	3,756,874	3,042,027	4	1		45	50	18	1	4	340	363	277	42	54	54
Dist. 2: Middle Gulf	24	9	7	33		73	60	87	417,717	560	544	+ 2.9	3,463,949	3,262,348	2	1		19	22	9	5	4	168	186	202	47	41	44
Dist. 3: Upper Gulf	67	10	8	63		148	175	150	1,036,454	1,216	1,187	+ 2.4	8,146,524	7,605,330	3	1		42	46	17	8	4	292	321	301	137	151	137
* Gulf of Mexico				1		1		1	9,900	5	9	— 44.5	49,988	90,917				1	1				4	4	4	4	6	3
Dist. 4: Lower Gulf-S.W.	41	14	9	54		118	133	124	632,322	989	913	+ 8.3	5,244,110	4,832,258	4	4	3	37	48	16	10	14	291	331	318	64	67	81
* Gulf of Mexico		1				1		1	8,264	7	9	— 22.2	68,987	85,801									1	1	2	2	2	3
Dist. 5: East Central	6			14		20	27	22	58,099	169	180	— 6.1	557,415	701,825				13	13				90	90	98	10	11	13
Dist. 6: Northeast	48	2	2	24		76	74	61	381,255	599	463	+ 29.4	3,159,164	2,534,991	1			12	13	10	1	2	142	155	130	85	67	57
Dist. 7-B: North Central	135		6	136		277	172	309	1,028,345	2,062	2,091	— 1.4	7,325,307	6,669,023	26		3	100	129	122		11	691	824	737	118	112	165
Dist. 7-C: West Central	112		2	51		165	106	115	724,692	907	817	+ 11.0	4,082,072	4,513,403	7			37	44	32		2	195	229	224	120	106	109
Dist. 8: West	415	1	2	71		489	432	459	2,580,246	2,945	2,542	+ 15.9	15,120,402	13,901,102	8	1		32	41	67	3	2	294	366	357	300	297	384
Dist. 9: North	201		7	234	4	446	426	319	1,370,062	3,545	2,428	+ 46.0	10,506,836	7,906,865	10		2	112	124	75		8	688	771	523	262	202	215
Dist. 10: Panhandle	112	5	24	13		154	143	89	659,032	965	647	+ 49.1	3,761,051	2,296,617	4	3	7	6	20	14	5	16	58	93	43	89	97	80
Utah	4		1	8		13	12	5	56,216	97	63	+ 54.0	453,679	291,964				8	8	2		2	61	65	49	28	33	24
Washington										1			7,493										1	1				
West Virginia	14		46	8		68	49	60	189,067	467	409	+ 14.2	1,234,741	1,061,843											19	190	185	188
Wyoming	28	1	1	45		75	71	63	328,776	590	476	+ 23.9	2,717,826	2,340,637		1		18	19	5	2	3	144	154	133	101	108	103
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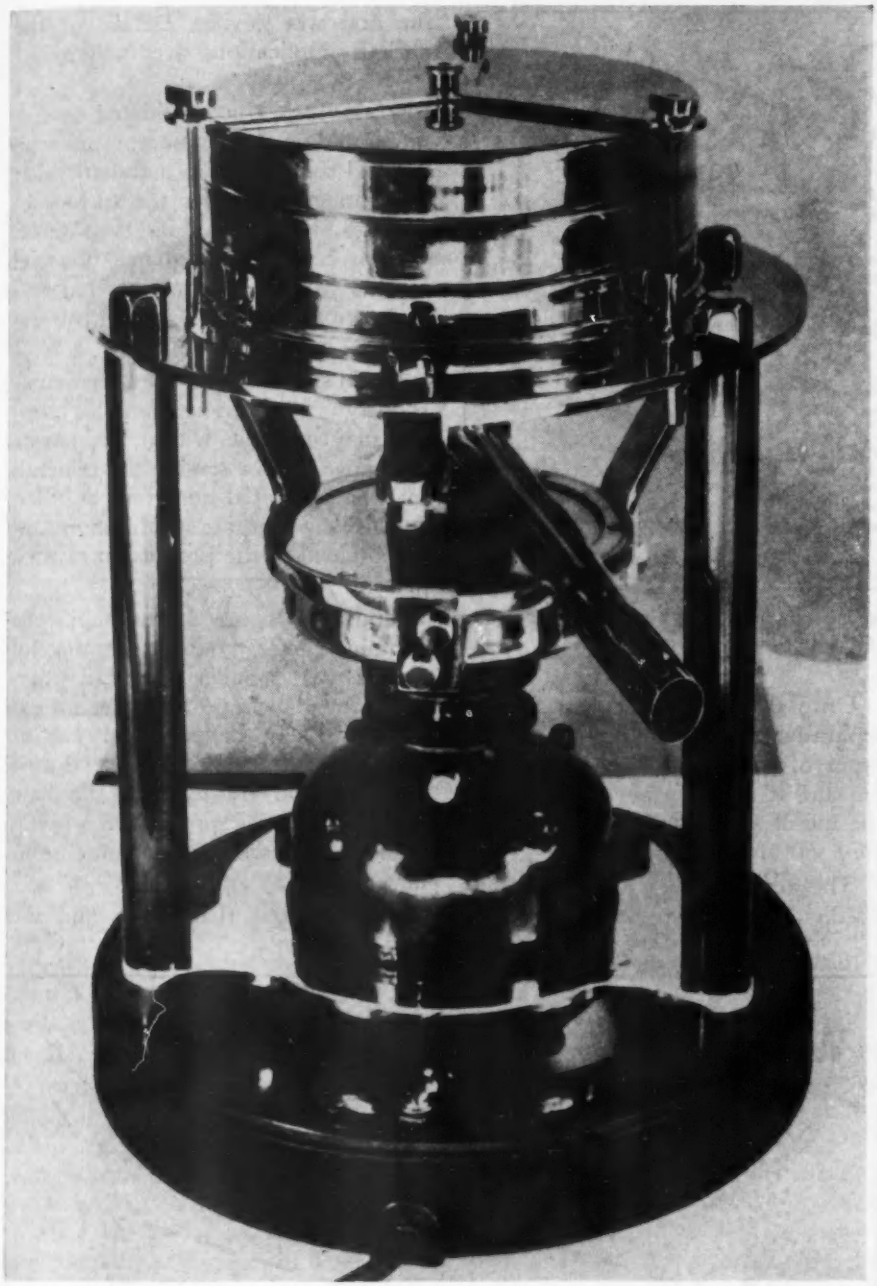

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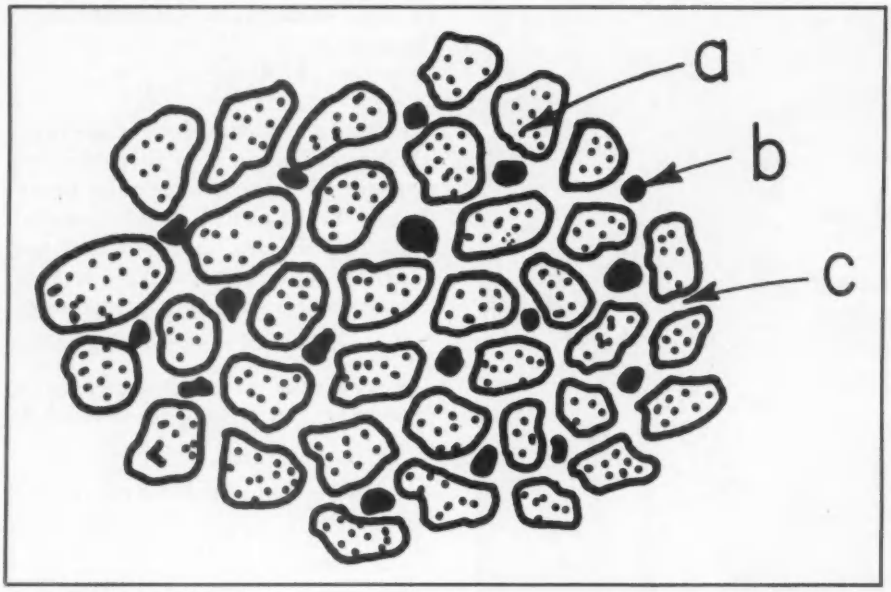

FIGURE 1—Thin section of sandstone as seen under microscope showing quartz (a), glauconite (b) and calcitic cement (c).

a granite is a mixture of three minerals in the main; quartz, mica and felspar. Mineral deposits, on the other hand, may be classified as being of igneous origin such as the tin and copper of the Cornish mines, or of secondary origin such as the haematites of Cumberland.

From the point of view, however, of this investigation—that type of geological research in which the gyratory vibrator plays an integral part—all types of rock and mineral deposits fall into one of two groups. They are consolidated material or unconsolidated material.

The difference can be demonstrated from an everyday example. The sand of the seashore is largely composed of quartz grains which are not cemented together, but a sandstone is merely sand of an ancient seashore or desert in which the quartz grains have become bound together by the cementing action of iron oxide, of silica, or of calcareous or limey material. In the first instance the individual particles already are separated from one another, but in the second case—that of a consolidated material—methods must be employed for destruction of the cementing material or condition before investigation can be continued. Such methods are either mechanical (crushing) or chemical (use of dilute HCl).

Selection of a disintegration method depends upon type of investigation being carried out. Usually it is necessary to insure that the natural grain size of the material is not affected.

Once the component particles are separated one from another, several types of investigation become possible and it is in certain of these that the use of sieves, and hence the gyratory vibrator, is employed.

The actual process of sieving may be divided into two classes, dry sieving and wet sieving. Details of the various applications are included.

Dry sieving. Unconsolidated or disintegrated rock or mineral material is dried thoroughly in a radiant heat oven and placed over the surface of the top sieve in a thin, even layer. The process of sieving such material into its various size fractions has several applications in geological research:

Grain size analysis—In a particular rock type the various minerals present may each lie within a separate size range and by sieving the minerals may be separated one from another. In this way accurate information may be obtained of the proportion of each present.

Thus, in Figure 1, the sandstone contains large rounded grains of quartz (a), smaller angular fragments of glauconite (b), and an extremely finely disseminated calcitic cement (c). Loss of weight during disintegration by hydrochloric acid will indicate the proportion of (c), while sieving will yield similar information for (a) and (b).

It is obvious that shape and size

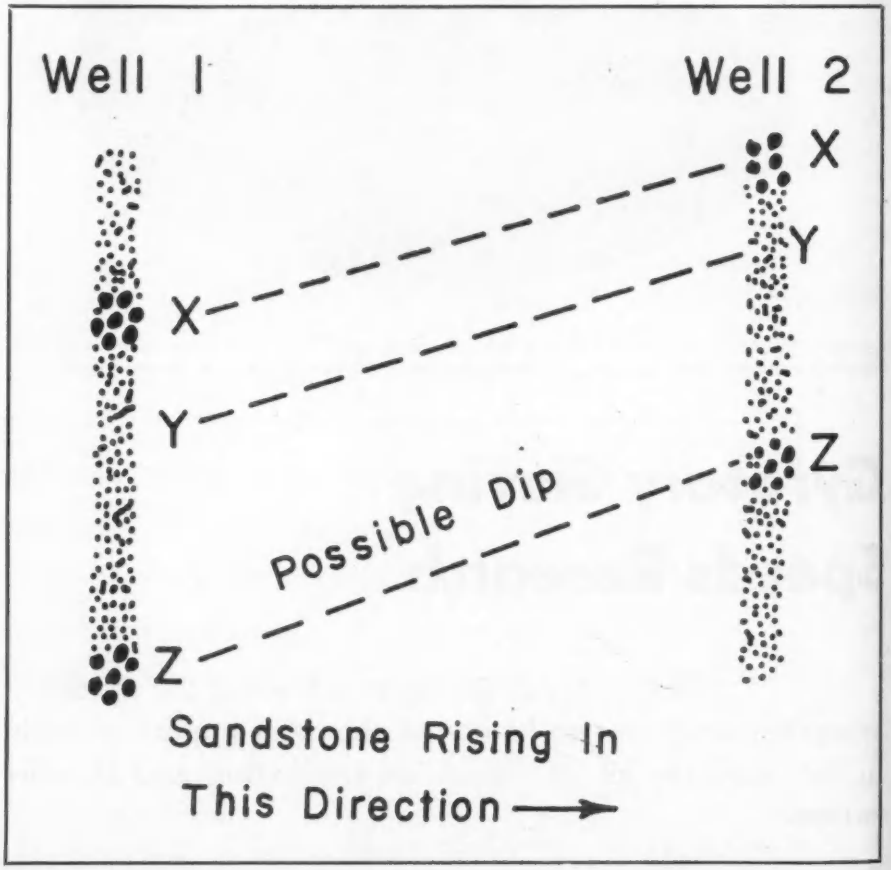

FIGURE 2—Diagram showing two wells drilled in an apparently homogeneous sandstone but with dip of bed shown by slope of three horizons of larger grain size.

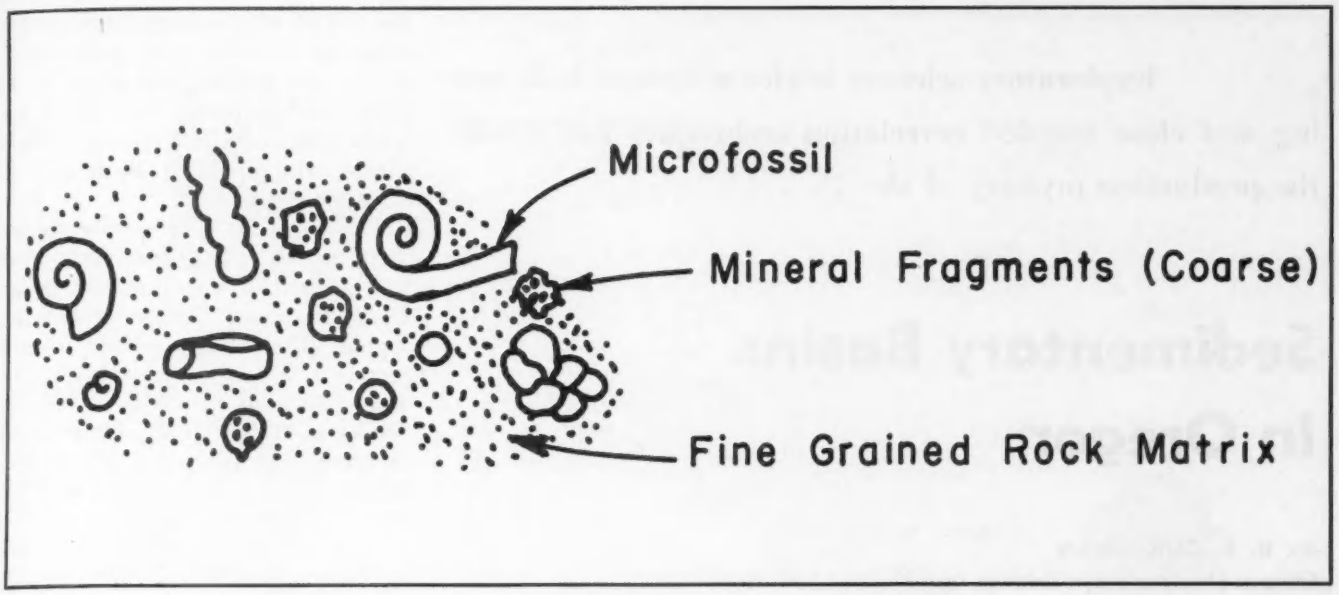

FIGURE 3—Diagram of a typical fossiliferous rock containing a microfaunal assemblage.

of such quartz grains and the proportions of cement will determine, in part, porosity and permeability of the rock. These two physical properties are, in turn, of major importance in oil reservoir beds. By sieving such material, shape of the various sizes of grains can be studied. The information so gained, assists in the estimation of porosity and permeability.

A further application in grain size analysis lies in stratigraphical work. A sandstone may appear to the eye to be the same throughout, but a detailed study may reveal that, at certain horizons, the grains are slightly larger than at others. Thus, in Figure 2, the two wells are drilled in the same sandstone but at the levels xX, yY and zZ, the grains are found to be larger. This indicates the attitude of the sandstone and assists in the location of further wells.

Separation of mineral fragments—This is a development of grain-size analysis but is of major importance to the mineralogist and metallurgist. A particular rock may contain a rare or valuable mineral as very small fragments, while the rest of the constituent minerals are larger. By sieving the unconsolidated material, the rare mineral will be concentrated on the finer meshes and separated in part from the coarser and unimportant other constituent minerals.

Microfaunal Analysis—Many of the sedimentary rocks contain minute fossils belonging chiefly to the Phylum Protozoa. The animals lived in the sea at the time the rocks were being laid down as mud on the sea floor; their shells became entombed after death, and the muds of the ancient seas became the rocks of the present day earth's crust. These minute fossils, chiefly foraminifera, are used in the interpretation of the structure of the rocks and are of major importance in all the oil regions of the world. Usually the rocks containing such fossils exhibit the features shown in Figure 3.

The fossils are normally of a larger relative size than the great proportion of the matrix, but are seldom greater than one millimeter in length. By sieving the unconsolidated fraction of such fossiliferous sediments, it is possible to separate off the fossil content and coarser material from bulk of the matrix. The specimens are thus concentrated for micropalaeontological study. It is in this particular field that the gyratory vibrator is used most frequently in geological research.

Wet sieving. This class of sieving has certain important advantages over dry sieving which make it more desirable in geological research. Under this method, the unconsolidated material is placed on the top sieve and a continuous jet of some lubricant, usually water or soapy water, is played onto the material throughout the period of sieving. The advantages of this method over the dry sieving process may be listed:

- The process of sieving is accelerated.
- The lubricant assists in the disintegration of the material.
- The lubricant provides a cushioning medium by reason of surface tension and also protects particles once the correct sieve size has been reached. This is particularly important in micropalaeontology where the minute fossils usually process a very delicate and fragile construction and where the lubricant does play a major protective role.
- The introduction of a lubricant, such as benzene or chloroform, is often necessary during disintegration of a sediment which contains petroleum to remove the heavy oil fraction and insure clean particles and fossils for analysis.

The gyratory vibrator type unit has been used in wet sieving by adding quantities of lubricant at intervals during the sieving process. This is rather unsatisfactory since the machine must be stopped and uncoupled for the lubricant to be introduced. To overcome this difficulty, some of the units are fitted with a special cover which allows continuous wet sieving. **—The End**

Exploratory science, intricate bottom hole testing and close coupled correlation techniques will unlock the production mystery of the . . .

Sedimentary Basins In Oregon

By R. E. CORCORAN
Oregon Department of Geology and Mineral Industries

OREGON HAS SEEN a greatly accelerated petroleum exploration program during the past two years. The activity has included not only core drilling, geophysical prospecting, and surface exploration, but actual drilling operations.

In 1953 the Oregon legislature passed an oil and gas conservation law and instructed that it be administered by the governing board of the State Department of Geology and Mineral Industries. The board was directed to set up rules and regulations for the future guidance of oil and gas operators in the State. Since December 1953, 17 permits for exploratory drilling in Oregon have been issued; 12 of these were granted in 1955.

Most of Oregon has been examined, at least on a reconnaissance basis, by numerous oil company geologists and independent drillers since the early part of the 1900's. Recent work has been concentrated in a few areas. These include the Tertiary marine basin of western Oregon (Figure 1), the Paleozoic-Mesozoic area of central Oregon, and the Tertiary continental area of the Snake River along the central border of Idaho and Oregon. To a lesser extent, the Harney and Lakeview Tertiary continental area of southern Oregon has been investigated. The Tertiary marine basin and the Snake River plains have seen the greatest drilling activity. Recently more attention is being focused on the Paleozoic-Mesozoic area of central Oregon.

Drilling Activity. Explorational drilling has been carried on sporadically by individuals or small independent operators since 1900, but major oil company activity in the state has been confined chiefly to two periods in the last 15 years. The first period was during the early and middle 1940's when five deep tests were drilled in the Tertiary marine basin.

In 1950 geological exploration in western Oregon was renewed and drilling activity has continued to the present. The western part of the state in both periods has been the area of major interest. However, Shell Oil Company's successful producer in Nevada stimulated interest in the Snake River Tertiary continental area. Also, the eastern Oregon "play" was given added impetus when it was announced that the gas pipe line from the San Juan Basin would pass through that part of the state.

For an area the size of Oregon exploratory drilling has been sparse, and few wells have had adequate supervision or testing by competent people. Although over 200 holes have been drilled in the state, almost three-fourths of these are less than 3000 feet deep and what records that were kept offer little or no subsurface information. Most of the remaining 25 percent (27 wells) have penetrated deep enough to yield some stratigraphic data. These have been plotted on Figure 1 and have been divided into three major groups as follows: 3000 to 5000 feet, 5000 to 10,000 feet, and over 10,000 feet.

Where Activity Concentrated. The Tertiary marine basin of western Oregon is made up of a thick section of marine sediments and volcanics of Eocene to Miocene age, bounded on the east by the continental beds of the Western Cascades and on the south by the pre-Tertiary highlands of the Klamath Mountains. The basin extends northward into western Washington and includes most of the Olympic Peninsula.

Folding of the basin during the late Tertiary and early Quaternary periods has resulted in the formation of the Coast Range of Oregon and Washington. The total thickness of this section is unknown, but probably has a maximum of 15,000 to 20,000 feet (Baldwin, 1955). The oldest known formation is composed of basaltic lavas that no explorational well has yet penetrated.

Most of the test drilling in the state has been done in this area and includes 8 of the 11 wells put down by the major oil companies. Several wells have reportedly encountered small quantities of gas, and one well drilled by Oil Developers, Inc. (No. 11, Figure 1), near Roseburg, Ore., had a minor show of crude oil in some of the drill cuttings. Numerous oil seeps have been reported but not verified. Further evidence of petroleum in this basin was shown by the results of the Union Oil Company of California test near Grays Harbor, Wash. This well, drilled in 1949, produced almost 500 barrels of high gravity crude before being abandoned because of production difficulties.

Acting as a deterrent to drilling in this area are the hard, dense basaltic lavas interspersed throughout the section, and the apparent lack of porous horizons. Also the sandstones are predominantly graywackes or sub-graywackes having low porosity and permeability.

The most interesting well drilling in the basin is the 12,000-foot test (No. 9, Figure 1) by Sinclair Oil and Gas Company near Mapleton, Ore. More wells of similar depth will be necessary to test the area adequately.

Snake River Plains. The Snake River plains, sometimes referred to as the Snake River Downwarp (Kirkham, 1931), cover a very large area in southern Idaho and extend a short distance into eastern Oregon. The portion of this area between Vale, Ore., and the Oregon-Idaho line contains a section of Tertiary continental strata of unknown thickness. The region is not considered a simple downwarp or structural basin as there is evidence of large scale block faulting

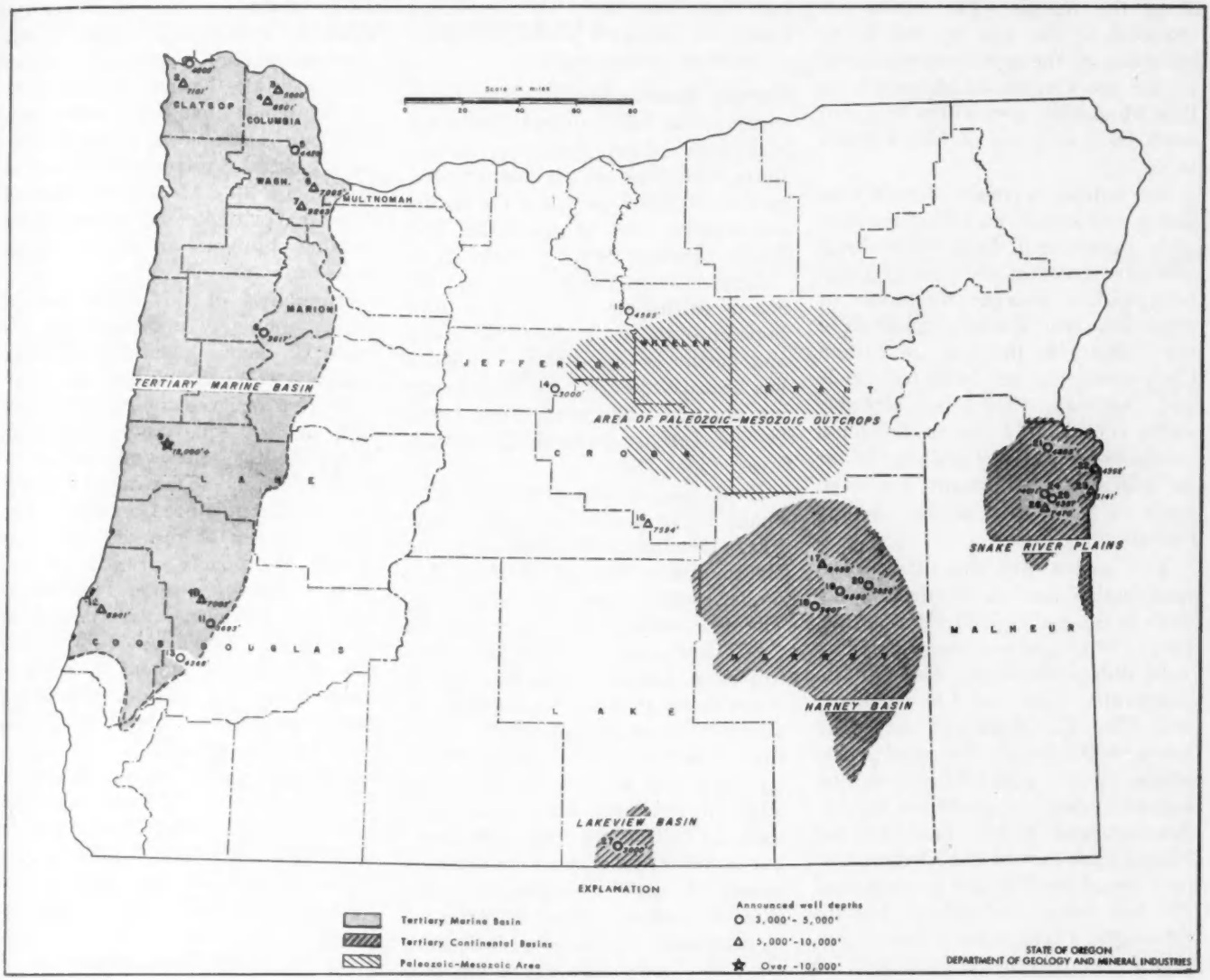

FIGURE 1—Sedimentary basins in Oregon.

WELLS PLOTTED ON FIGURE 1

1. Lower Columbia Oil and Gas Co., Brown No. 1, Clatsop County, NW¼ sec. 25, T. 8 N., R. 10 W.
2. Standard Oil Company of Calif. Hoagland Unit No. 2, Clatsop County, SW¼ sec. 11, T. 7 N., R. 10 W.
3. The Texas Company, Clatskanie No. 1, Columbia County, E¼ cor. sec. 36, T. 7 N., R 4 W.
4. The Texas Company, Clark and Wilson No. 6-1, Columbia County, SE¼ sec. 19, T. 6 N., R. 4 W.
5. Lease Holding Syndicate, Dutch Canyon Well, Columbia County, NW¼ sec. 17, T. 3 N., R. 2 W.
6. Richfield Oil Company, Barber No. 1, Multnomah County, SE¼ sec. 23, T. 1 N., R. 1 W.
7. The Texas Company, Cooper Mountain No. 1, Washington County, E¼ cor. sec. 25, T. 1 S., R. 2 W.
8. Portland Gas and Coke Company, Weiderker No. 1, NW¼ sec. 24, T. 9 S., R. 4 W. Marion County.
9. Sinclair Oil and Gas Company, Federal Mapleton No. 1, Lane County, SE¼ sec. 12, T. 16 S., R. 10 W.
10. Union Oil Company of California, Liles No. 1, Douglas County, NE¼ sec. 27, T. 25 S., R 7 W.
11. Oil Developers, Inc., Scott No. 1, Douglas County, SW¼ sec. 5, T. 27 S., R. 6 W.
12. Phillips Petroleum Company, Dobbyns No. 1, Coos County, SW¼ sec. 28, T. 26 S., R. 13 W.
13. Uranium Oil and Gas Company, Ziedrich No. 1, Douglas County, NW¼ sec. 16, T. 29 S., R. 8 W.
14. Northwest Oils, Inc., Morrow Bros. No. 1, Jefferson County, SW¼ sec. 18, T. 12 S., R. 15 E.
15. Clarno Basin Oil Company, Burgess No. 2, Wheeler County, SE¼ sec. 34, T. 7 S., R. 19 E.
16. Standard Oil Company of Calif., Pexco No. 1, Crook County, SW¼ sec. 36, T. 20 S., R. 20 E.
17. United Company of Oregon, Inc., Weed and Poteet No. 1, Harney County, NW¼ sec. 9, T. 23 S., R. 31 E.
18. Central Oregon Oil and Gas Co., SE¼ sec. 24, T. 25 S., R. 30 E., Harney County.
19. I. W. Love Drilling Company, H. C. Voglar No. 1, Harney County, SE¼ sec. 25, T. 24 S., R. 31 E.
20. United Company of Oregon, Inc., Fay No. 1, Harney County, SE¼ sec. 9, T. 24 S., R. 33 E.
21. Sinclair Oil and Gas Company, Eastern Oregon Land Company No. 1, Malheur County, SW¼ sec. 15, T. 16 S., R. 44 E.
22. Ontario Cooperative Gas and Oil Company, Malheur County, SE¼ sec. 9, T. 18 S., R. 47 E.
23. H. K. Riddle, Kiesel Estate No. 1, Malheur County, SW¼ sec. 8, T. 19 S., R. 47 E.
24. Idaho-Oregon Production Company, Recla No. 1, Malheur County, SE¼ sec. 9, T. 19 S., R. 44 E.
25. R. A. Stamey, Russell No. 1, Malheur County, NW¼ sec. 14, T. 19 S., R. 44 E.
26. El Paso Natural Gas Company, Federal No. 1, Malheur County, NE¼ sec. 5, T. 20 S., R. 44 E.
27. Tri-State Gas and Petroleum Company, Fisher No. 1, Lake County, SW¼ sec. 22, T. 40 S., R. 19 E.

along the margin. The plains are bounded on the east by the Idaho batholith, on the north and northwest by the pre-Tertiary highlands of the Blue Mountains, and on the west and south by a covering of late Tertiary lavas.

The sediments consist of tuffaceous shales, sandstones, and conglomerates with intercalated lavas. Vertebrate evidence indicates the age to range from middle Miocene to middle or upper Pliocene. The total thickness of the Tertiary in this part of eastern Oregon may exceed 15,000 feet (Dole and Corcoran, 1954), but probably varies considerably due to repetition or omission of beds by faulting. So far no public announcement has been made of penetration of the Tertiary formations.

This region was the center of a considerable amount of drilling activity in the early 1900's (Washburne, 1911), when gas was encountered in wells drilled for water. The Ontario Cooperative Gas and Oil Company well (No. 22, Figure 1) drilled to below 4000 feet hit a gas pocket having pressure sufficient to blow mud and water over the top of the derrick. Another well drilled near Payette, Idaho, (just east of the Oregon border) found considerable gas in a sand 750 feet below the surface. Analysis (Buwalda, 1921) showed that it contained 99.1 percent methane and 0.9 percent nitrogen and was believed to be marsh gas formed through decomposition of vegetable material buried in the sediments.

Activity in this area was renewed in 1953 when Sinclair Oil and Gas Company leased extensive acreage around Vale, Ore., after completing several months of explorational work. Since that time Sinclair (No. 21, Figure 1), El Paso Natural Gas Company (No. 26, Figure 1), R. A. Stamey (No. 25, Figure 1), and H. K. Riddle (No. 23, Figure 1) have each drilled one test. Gas has been the only product encountered so far and it has not been proven to be of the type usually associated with petroleum. The volume in a few wells has indicated interesting amounts and drilling is continuing.

The problems confronting the driller in the Snake River plains are almost opposite to those encountered in the western part of the state. Here many coarse sandstone beds in the section would make excellent reservoir rocks, but there has been little evidence found to indicate that petroleum source beds exist at depth.

Harney Basin. The Harney basin covers about 5300 square miles in the high lava plains centering around Burns, Ore. This area is characterized by internal drainage and is the northwesternmost part of the Basin and Range province of the western U. S.

Tertiary lavas and intercalated tuffaceous sediments having low dips slope into the basin from the south and north. To the east the structure has been complicated by block faulting and the western edge is covered by late Tertiary or early Quaternary lavas (Piper, 1939).

Explorational activity in the nearby Snake River plains during the early 1900's stimulated some drilling in the Harney basin because of somewhat similar rock types and geologic setting. The first wells, with one exception (3807 feet), were all less than 1500 feet deep, and although one or two encountered pockets of gas none was able to produce any appreciable quantities. Traces of oil were also reported, but were not verified. In 1949 and 1950, three fairly deep holes were drilled (3826, 4550, and 6480 feet), but no oil or gas shows were reported in any of them. The deepest of the three showed the upper 4000 feet to be composed of varicolored tuffaceous clays and shales with minor amounts of volcanic ash. The lower 3000 feet was mostly black lava with a few thin beds of altered tuffaceous clays.

The driller's problems in the Harney basin are much the same as those in the Snake River plains. The great thickness of continental deposits and associated lavas in these areas of eastern and southeastern Oregon, where there are no definitely proven petroleum deposits, will continue to have a restraining influence on drilling activity.

The Lakeview basin, which is geologically very similar to the Harney basin, is still very much of a question mark. In the last 15 years, 4 or 5 wells with depths ranging from 635 feet to 3000 feet have been drilled in the vicinity of Lakeview. A small amount of gas was encountered in one or two of these. Here again, chemical composition indicates that it is a marsh gas.

Paleozoic-Mesozoic Area. Throughout a large part of central Oregon there are numerous exposures of essentially unmetamorphosed Paleozoic-Mesozoic marine sediments. These outcrops usually occur as erosional windows in the Tertiary deposits or as old highlands that may never have been buried completely. Beds of similar age are also present farther to the east in the Blue Mountains. Most of these have undergone considerable metamorphism and are unlikely source areas for petroleum.

Boundaries of this basin can be shown only very approximately because of widely separated outcrops and lack of published geologic mapping. It is believed there is a total of 6000 to 8000 square miles underlain by marine limestones, sandstones, conglomerates, and shales ranging in age from Mississippian to Cretaceous. The total thickness of this section is unknown. It probably varies widely due to post-Mesozoic erosion. However, it has been estimated that there is at least 3500 feet of Paleozoic and 15,000 feet of Jurassic sediments in the Suplee-Izee area of southwestern Grant County (Merriam and Berthiaume, 1943 and Lupher, 1941).

Although potentially of great promise as a petroleum province, the basin has remained virtually untouched by the exploratory drill. This is due largely to the fact that much of the area is covered by Tertiary formations. These younger deposits are separated from the older by a major unconformity and therefore probably do not reflect the pre-Tertiary structures. In areas where the Paleozoic-Mesozoic is well exposed, folding and faulting have complicated the structural aspect and obscured the stratigraphic relationships. Valid geologic interpretations can be made in this area only after detailed mapping.

BIBLIOGRAPHY

[1] Baldwin, E. M., 1955, Geology of the Marys Peak and Alsea quadrangles, Oregon: U. S. Geol. Survey Oil and Gas Invest. Map OM 162.

[2] Buwalda, J. P., 1921, Oil and gas possibilities of eastern Oregon: Oreg. Bur. Mines and Geology, Mineral Resources of Oreg., vol. 3, no. 2.

[3] Dole, H. M. and Corcoran, R. E., 1954, Reconnaissance geology along U. S. Highway 20 between Vale and Buchanan, Malheur and Harney counties, Oregon: Oreg. Dept. Geology and Mineral Industries. The Ore-Bin. vol. 16. no. 6.

[4] Kirkman, Virgil R. D., 1931, The Snake River downwarp: Jour. Geology, vol. 39, no. 5.

[5] Lupher, R. L., 1941, Jurassic stratigraphy of central Oregon: Geol. Soc. Am. Bull., vol. 52, no. 2.

[6] Merriam, C. W. and Berthiaume, S. A., 1943, Late Paleozoic formations in central Oregon: Geol. Soc. Am. Bull., vol. 54, no. 2.

[7] Oregon Department of Geology and Mineral Industries. 1954, rules and regulations for the conservation of oil and natural gas: Misc. Paper 4.

[8] Piper, A. M., Robinson, T. W., and Park, C. F., Jr., 1939, Geology and ground-water resources of the Harney basin, Oregon: U. S. Geol. Survey Water-Supply Paper 841.

[9] Stewart, R. E., 1954, Oil and gas exploration in Oregon: Oreg. Dept. Geology and Mineral Industries Misc. Paper 6.

[10] Washburne, C. W., 1911, Gas and oil prospects near Vale, Oregon and Payette, Idaho: U. S. Geol. Survey Bull. 431-A.

Salt Domes of Eastern Hemisphere . . .

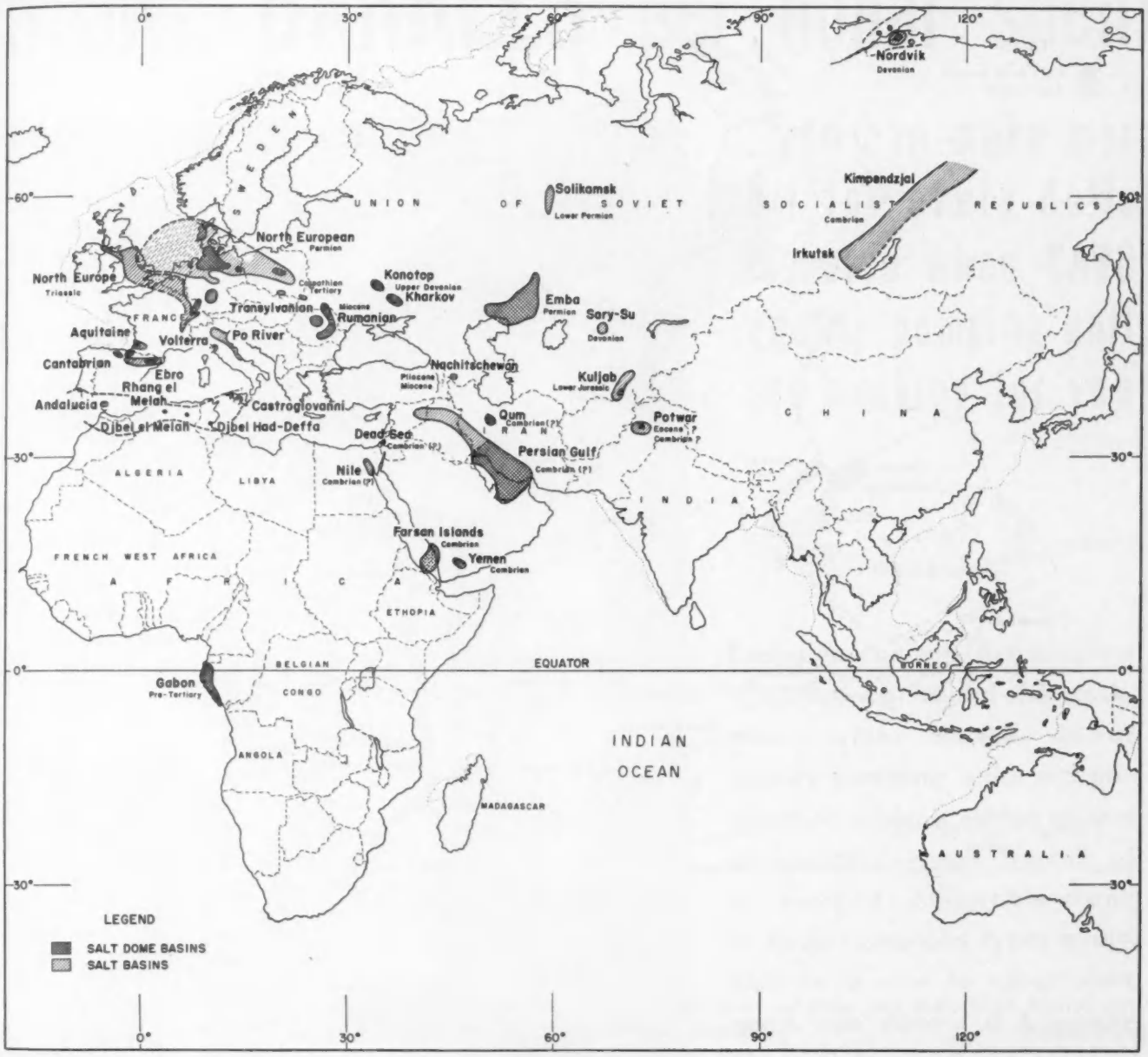

FIGURE 1

Salt Dome Interest Centers on Gulf Coast

Here's a review of salt dome reservoirs of the world with special emphasis on U. S. Gulf Coast where drilling has proven presence of large reserves.

By DR. J. BRIAN EBY
Consulting Geologist, Houston

THE FANTASTICALLY great economic bearing of salt beds and domes and their associated minerals on the economy of the world sets them apart as geologic features of special interest. Not only is the salt itself being mined in increasing quantities, but the rich chloride minerals of sylvite and carnallite come from salt deposits, especially in the German salt mines. The domes of Texas and Louisiana Gulf Coast have produced millions of tons of pure sulfur and within the last two or three years the caprock of several of the Mexican coastal domes have

Salt Domes of Western Europe . . .

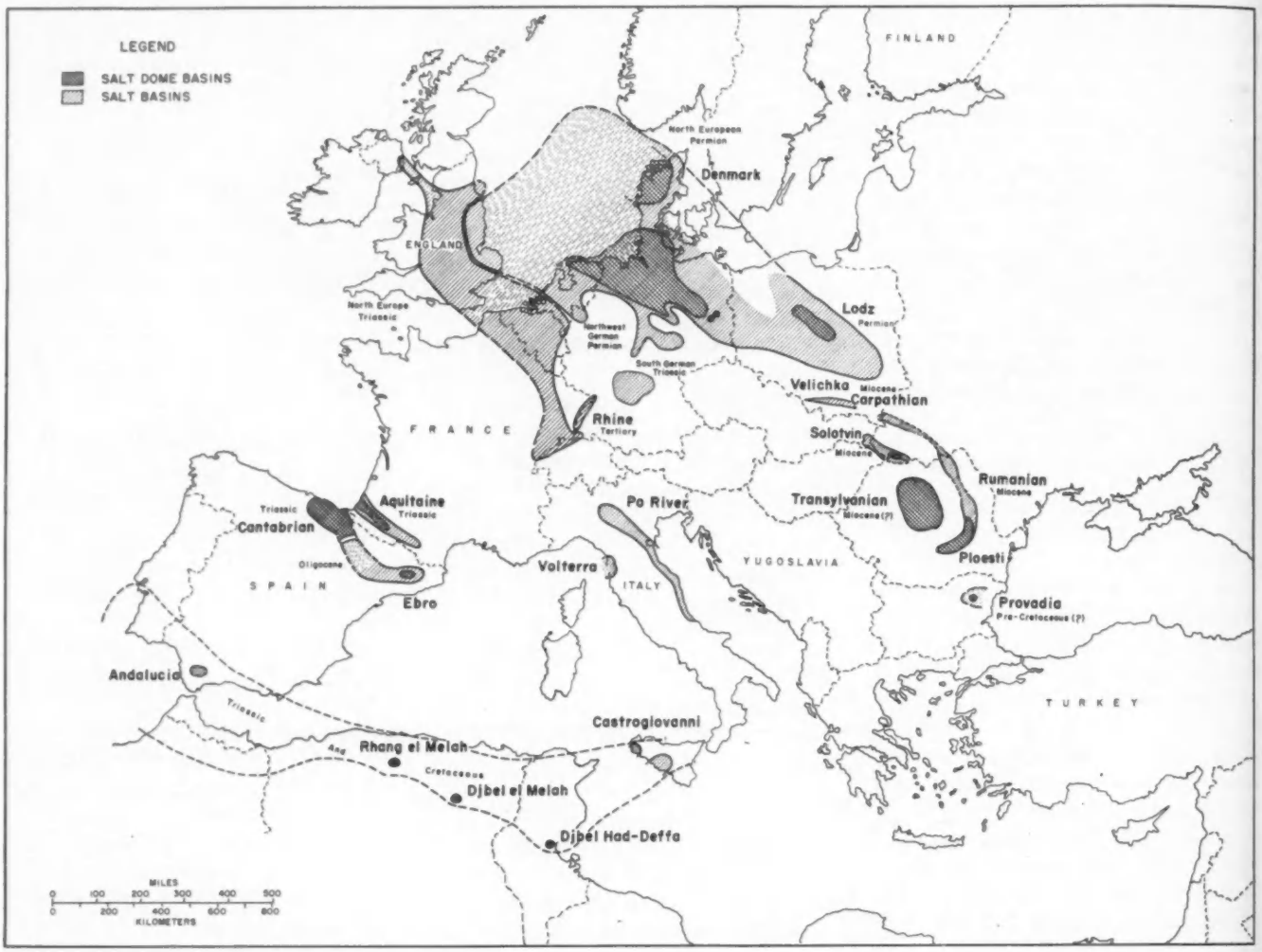

FIGURE 2

been proved to contain vast quantities of sulfur.

Over and above the minerals found in association with salt is the important function of the salt dome in forming structural and stratigraphic traps to bring about oil and gas accumulations in vast economic quantities. Since the finding of the fabulously rich Spindletop salt dome oil field in January, 1901, the search for new domes and new salt dome basins has spread the world over. The introduction of applied geophysics early in the 1920's to this search was successful and advanced the work of salt dome discoveries by many years.

The salt basin occurrences in the Eastern Hemisphere are indicated by Figure 1. In the Soviet Union, the well known Emba region at the north end of the Caspian Sea is about one half the size of the U. S. coastal basin and contains several hundred salt domes. However, there is one important difference between the Emba basin and the Gulf Coast basin of the U. S.; the Emba basin is of limited depth, about 16,000 feet to the top of the bedded salt, or 23,000 feet to the base of the salt. In the Gulf Coast basin, the depth has been interpreted by geophysics to be in excess of 35,000 feet. The Emba salt is Permian.

Two comparatively new basins have salt beds partially outlined by the Russians in Siberia; the Nordvik area, with salt in Devonian rocks, and a huge area extending northeasterly from Irkutsk in central Siberia. This basin of relatively unfolded salt is called the Kimpendzjai-Irkutsk area. The rocks containing the salt are Cambrian.

The salt beds of Iran, Yeman, Farsan Islands, Egypt and Israel are indicated, and the majority opinion is that all of these salt occurrences are of Cambrian age. Where doubt exists a question mark is shown on the map location.

The Gabon salt dome area of French Equatorial Africa, according to the recent annual report of the Bureau de Recherches de Petrole, now lists 100 salt domes already located either by drill or geophysics. The important oil discovery, the Ozouri salt dome oil field, expects to go on production early in 1957 at the rate of 2000 barrels of oil daily.

There are no known salt dome basins, to the writer's knowledge, in either China or Australasia.

The salt beds and domes of Western Europe are shown in more detail by Figure 2. The wide extent of the German basin and the extension of the salt far out under the North Sea

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Salt Domes of Western Hemisphere . . .

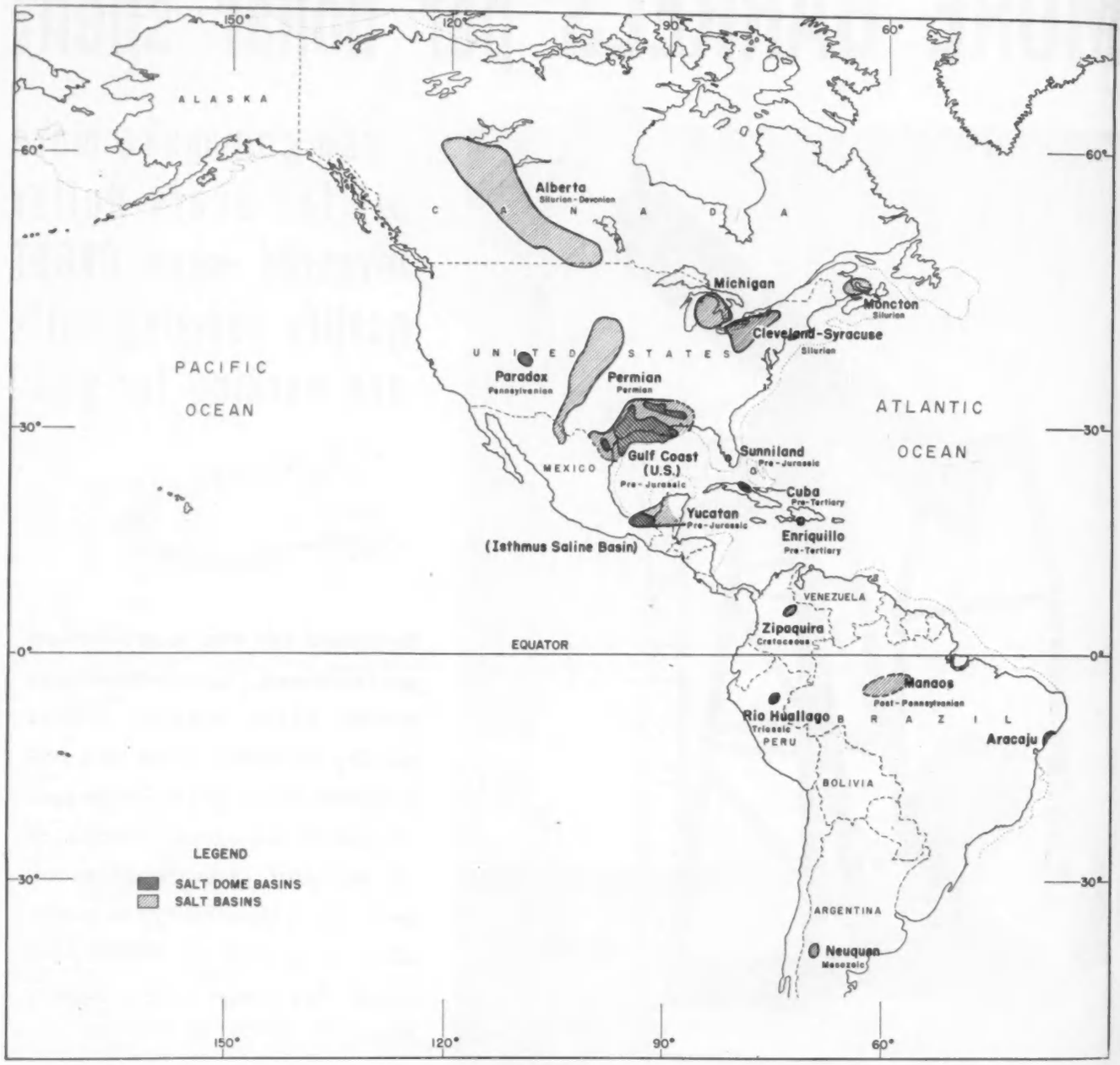

FIGURE 3

would seem to indicate new problems of Continental Shelf drilling for the near future. The Triassic salt basin from the Swiss-French border to near Belfast, Ireland, has a north-west alignment and overlaps the Permian German (North European) basin.

The recent discovery of salt in a well in Southern Portugal extends the range of the general Triassic-Cretaceous salt beds from Sicily in the east across North Africa, into Southern Spain, and now Portugal. The area is not cross-hatched, except for several specific salt dome occurrences as noted. One or two other salt dome occurrences in Morocco have been mentioned to the writer, but have not been located.

The salt basin pattern of the Western Hemisphere is indicated by Figure 3, from the great Alberta salt basin of Silurian and Devonian age in Canada to the Neuquen basin of Southern Argentina.

Within the past few years several new occurrences of bedded salt and salt domes have been found in South America and the Caribbean area. The most recent of these are the discoveries of salt in Cuba; in the Enriquillo basin of the Dominican Republic and at Manaos on the Amazon in Brazil.

In Mexico the Isthmus Saline Basin is believed to extend into Yucatan and the southern waters of the Gulf of Mexico, which is the Gulf of Campeche, will offer opportunity for marine exploration and Continental Shelf drilling.

The salt domes of the Gulf Region of the U. S. are the best known and most widely explored of any area in the world. The outlines of this coastal region and the basins carrying salt domes are indicated by Figure 4. As drawn on this map, there are three basins that contain salt domes; first, the Texas-Louisiana Coastal basin, including the East Texas or Tyler basin;

Salt Domes of U.S. Gulf Coast Area . . .

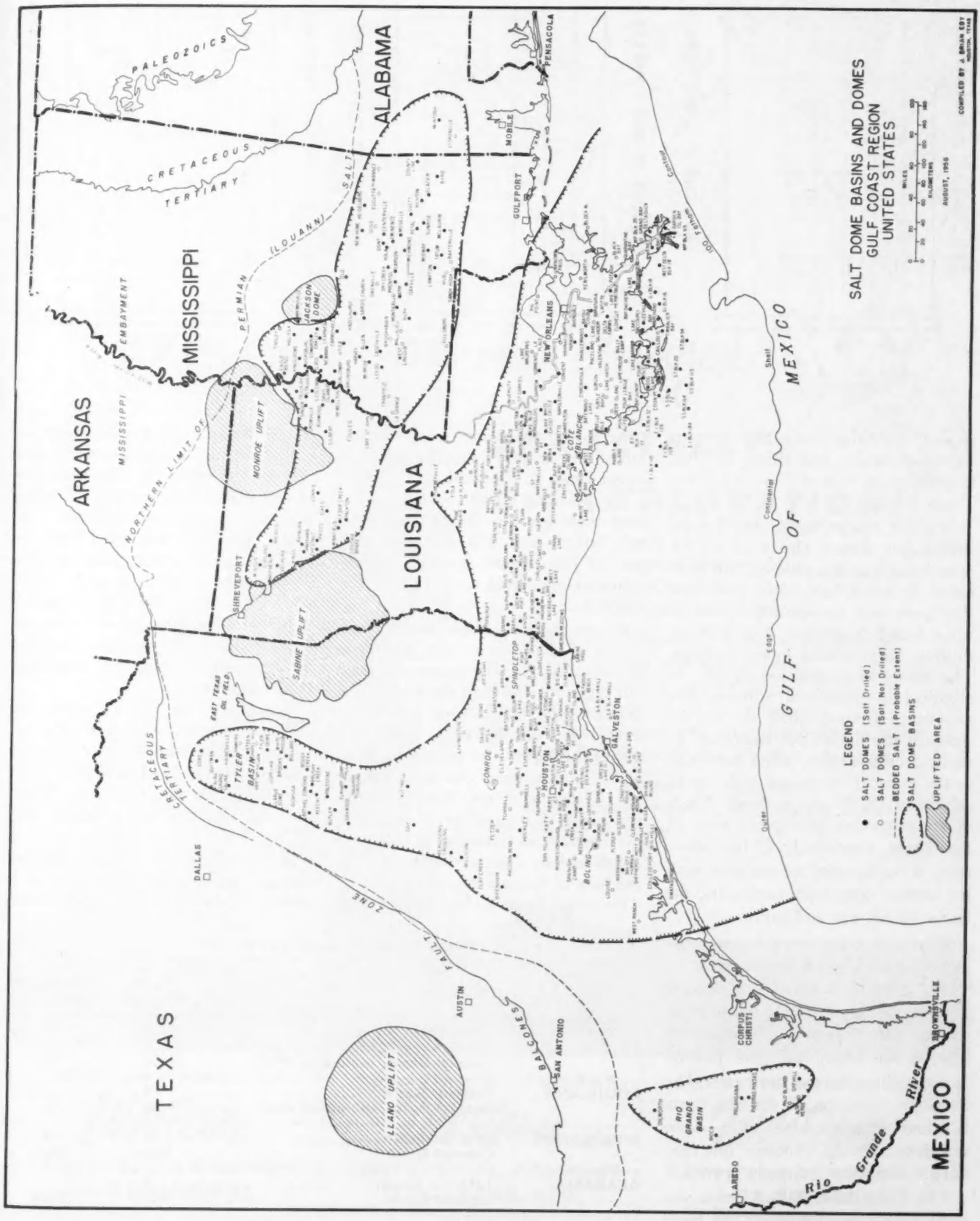

FIGURE 4

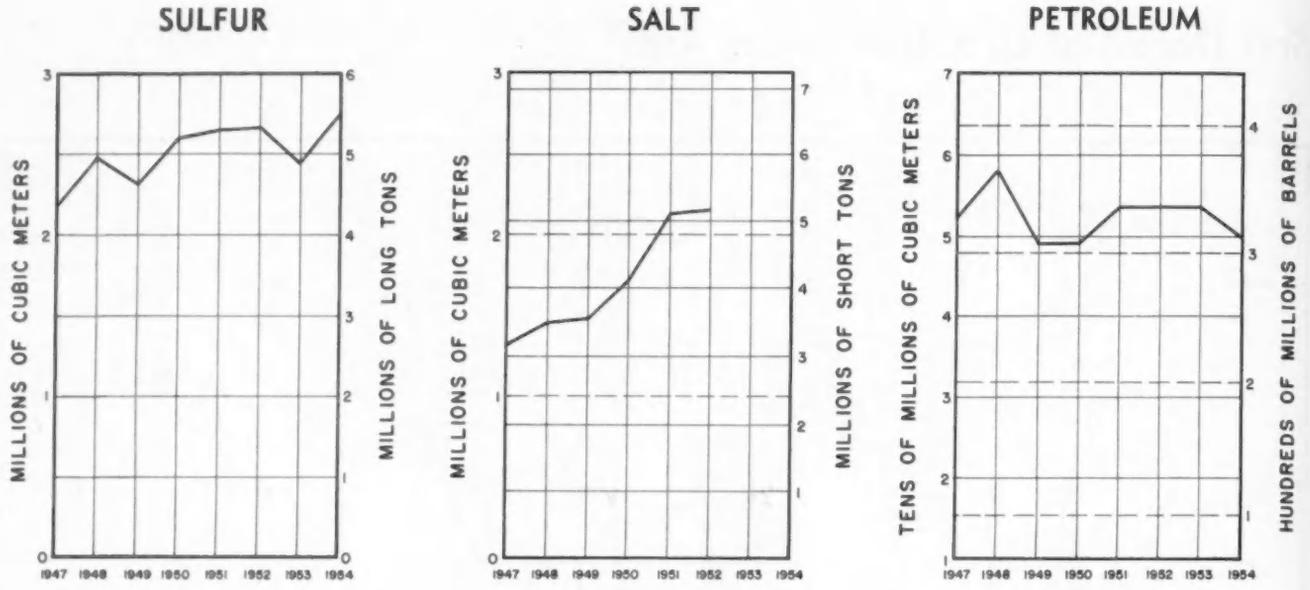

FIGURE 5

second, the Louisiana-Mississippi Interior basin; and third, the Rio Grande basin, west of Corpus Christi, Texas.

Within these basins the known drilled salt domes, those in which actual salt was encountered, are indicated by black dots, and structures that have well known dome-like features, based on geology, geophysics or drilling, are indicated by open circles. The domes in general are circular to elliptical in horizontal cross-section, and range from one-half to over six miles in the major axis diameter. In vertical cross-section, some have salt at the surface; others are with top of salt below 15,000 feet in depth. Much of the subsurface geology on some of the domes, especially of the newer ones, is confidential information with the various companies controlling the leases for oil, gas and sulfur.

The bordering tectonic features surrounding the Coastal Region are indicated. They comprise the Central Minera Region, or Llano Uplift on the west; the Sabine and Monroe uplifts on the north; and the Jackson igneous plug on the northeast. The Southern extension of the Salt basin is presumed to reach the edge of the Continental Shelf although this cannot be said to be definitely proved.

The Tyler Basin of East Texas was undoubtedly an independent basin during its early history, but as Levorsen pointed out some time ago, it was tilted late in Miocene times, or even later, and emptied directly into the larger basin on the south.

As indicated on the accompanying map there are 246 domes listed with salt drilled, and 115 domes reliably proved but without actual salt encountered. They are itemized in Table 1.

Tectonically the Gulf Coast Basin is one of the most perfect geological situations for the development of pure salt dome structures in the world. The depth of the basin, based on seismic data reported by L. L. Nettleton, places the top of the mother salt bed at the present coast line near Galveston, Texas, at 40,000 feet. However, this order of magnitude is confirmed by magnetic estimates of basement depth and by seismic reflections from the base of the salt columns in domes. This great depth of basin, filled with clastic deposits and marine shales exerted a tremendous and uniform pressure on the salt beds. The properties of salt under high pressure and long geologic time are not entirely clear but it is evident that relief from this pressure, resulting from faults or other irregularities, caused the salt to mushroom upward to form a variety of salt plugs. The long distance of travel upward forced the salt into rounded forms as offering the least resistance to the movement.

All of the rocks drilled into between domes in the Lower Gulf Coast, within a strip roughly 100 miles wide and parallel to and landward from the shore line, are Tertiary in age, and the older rocks are deeper than 12,000 feet.

The salt of the Gulf Coast basin as far as coastal geologists agree is younger than the West Texas Permian

TABLE 1—Salt Domes on Gulf Coast U. S.

		Salt Found	Domes, No Salt Found
TEXAS	Tyler Basin	20	7
	Rio Grande Basin	5	2
	Coastal Basin, including shelf	56	38
LOUISIANA	Interior Basin	24	2
	Coastal Basin, including shelf	93	51
MISSISSIPPI	Interior Basin	47	14
	Coastal Basin	None	None
ALABAMA	Interior Basin	1	1
	Coastal Basin	None	None
TOTAL:	Domes with salt	246	
	Domes Salt Not Drilled		115

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Salt and is older than Cretaceous, but probably not much older than Upper Jurassic. It has been called Louann in age or Louann Salt. No one seriously questions the origin of the salt as the result of a desiccating arm of the sea, probably lagoonal and in a severely dry climate. The source of the salt or the sea water replenishment is not so easy. Halbouty and Hardin in a recent paper bring the salt from the West Texas area, and employ a large Lanoria land mass as having existed there in the area of the present Gulf of Mexico. A recent geophysical paper, however, by Miller and Ewing, who ran seismic profiles across the entire Gulf of Mexico from New Orleans to Yucatan, find a definite rise in the Mohorovicic discontinuity over the entire center portion of their profile across the Gulf. The Mohorovicic discontinuity is that seismic boundary or interface below which all seismic velocities are found to be about 8.^{0} to 8.^{3} kns per second. This discontinuity is found at similar shallow depths, about 60,000 feet under the permanent oceanic depressions. This would indicate the Gulf of Mexico is a permanent oceanic depression and much older than Mesozoic time. It would not rule out border lands, however, which undoubtedly existed in the Permian and most of Mesozoic time.

The domes of the Gulf Coast exhibit a variety of caprocks; a few domes have no caprock and several have over 1000 feet of massive caprock. The customary sequence in the thickest caprock, shows limestone and calcite on the upper surface with gypsum and anhydrite in the lower section overlying the salt. In such domes as contain sulfur, the mineral generally is found in the lower part of the limestone-calcite beds and just above the anhydrite.

The standard classification of Gulf Coast domes are the shallow plugs, salt above 2500 feet; the medium depth domes with salt from 2500 to 10,000 feet; and the deep-seated domes, with salt below 10,000 feet.

The first of these types is the shallow plug, and an example is the famous Spindletop salt dome, Jefferson County, Texas. Oil in gusher flow was found in porous sands and lime in the caprock of this dome Jan. 10, 1901, and started the search for other domes in frenzied haste. The cross-section of this dome indicates the normal pattern of a plug-type salt structure.

A second and almost equally famous dome, the Boling salt dome, Wharton County, Texas. This dome, about 60 miles southwest of Houston, is famous for its tremendous output of sulfur from the caprock, probably 75,000,000 tons in the last 20 years. Details of the flank beds on this dome, as worked out by Halbouty, suggest actual over-thrusting of lower beds on higher beds by the uplift of the salt. This dome, about six miles on the long axis, is one of the largest domes in the coastal area.

A fine example of a shallow dome with a very considerable overhang is the Cote Blanche Island dome, St. Mary's Parish, Louisiana. Recently, Shell Oil Company drilled approximately 12,000 feet of salt to re-enter the surrounding sediments and find oil. The well location was dictated by geophysics, an excellent achievement, and was recently described by Shell geologist, A. R. Stern.

The most notable deep-seated structure, a gravity minimum, and an undoubted salt dome of the deep-seated type, is the Conroe oil field of Montgomery County, Texas, about 35 miles north of Houston.

The exploration and development of the Continental Shelf, commonly called the Tidelands, off Texas and Louisiana, has greatly increased our knowledge of the geology of the salt dome basin. Within the past ten years, geophysical and drilling operations have proved the existence of salt domes far out under the Gulf of Mexico. Ira Cram has estimated that the total area of Shelf from the Rio Grande to Florida, from the shore line to 120 feet depth of water is about 75,000 square miles; and from 120 feet depth to 600 feet depth, is an additional 50,000 square miles.

As indicated on the salt dome maps in Figure 4, 20 domes have been discovered on the Shelf with salt drilled and eight others without salt being drilled. There are, of course, many additional geophysically located domes not yet released for publication. The extension of the salt basin far out under the Continental Shelf has led some geologists to believe that the salt beds may even underlie much of the Continental Slope as well (beyond the 600 feet depth).

Drilling operations are now being carried out as far as 60 miles from the coast and in water up to 80 feet in depth. Some operators are planning to drill in water of 100 feet in depth. Many new oil fields have been discovered in the drilling of these Continental Shelf domes, and the costly exploratory effort will yield profitable dividends.

This shelf drilling and geophysics to date, indicate a normal extension of the sedimentary beds far out onto the Shelf. Topographically the submerged Shelf plain slopes seaward at 10 to 12 feet per mile, a rate quite in accord with the seaward slope of the contiguous coastal land plain. There is no indication of a gulfward geosyncline as many geologists postulated a few years ago.

In conclusion, a very brief sketch of some of the productive value of the salt domes of the U. S. Gulf Coast region are indicated by the graphs in Figure 5. These graphs show the volume of petroleum, sulfur and salt produced on the domes (both salt drilled and no salt drilled domes) shown in Figure 4. The charts indicate the volume produced annually for only the last few years, 1947 to 1955, and serve only as comparative guides for domal basins elsewhere in the world.

Although the charts would indicate that domal petroleum is hardly holding its own, the decrease in production, as shown, is largely brought about by governmental restrictions to limiting the amounts of oil each dome can produce and market.

Gas and gas condensates of course are a rich and valuable product of salt dome reservoirs, but the writer has not undertaken this survey.

REFERENCES

Baker, A. A., Dane, C. H. and Reeside, J. B., Jr. 1933, Paradox Formation of Eastern Utah and Western Colorado; Bull. Amer. Assoc. of Petrol. Geol., Vol. 17, No. 8, pp. 963-980.

Bentz, A. 1953 (Germany), The Science of Petroleum; Oxford University Press, London, England, Vol. VI, Part 1, pp. 25-33.

Carsey, J. B. 1950, Geology of Gulf Coast Area and Continental Shelf, Bull. Amer. Assoc. of Petrol. Geol., Vol. 34, No. 3, pp. 361-385.

Cram, Ira 1955, The Gulf Coast Continental Shelf; Presented before Houston Geological Society, Houston, Texas, March Meeting. Cram is Senior Vice-President of Continental Oil Company.

Dellwig, L. F. 1955, Origin of the Salina Salt of Michigan; Jour. of Sedimentary Petrology, Vol. 25, No. 2, pp. 83-110.

Dupoy-Camet, Jacques 1953, Triassic Diapiric Salt Structures, Southwestern Aquitaine Basin, France; Bull. Amer. Assoc. Petrol. Geol., Vol. 37, No. 10, pp. 2348-2388; also, Petroleum Engineer, April, 1952.

Eby, J. Brian 1947, German Field Reitbrook Almost Ruined During War; The Oil Weekly (Now World Oil), April 7, 1947.

Eby, J. Brian; and Halbouty, M. T. 1937, Spindletop Oil Field, Jefferson County, Texas;

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PHOTO MAPS

35,800 sq. mi. of Cuban land and water areas were photo-mapped for geologic and general planning studies. The aerial mapping was performed at 32,000 ft. Back at AERO'S mapping headquarters in Philadelphia, the aerial photos, each covering 85 sq. mi., were compiled in a photo mosaic at a scale of 1:48,000.

PLANIMETRIC MAPS

At the same scale, planimetric maps were provided for 23,600 sq. mi., showing roads, trails, streams, railroads and hydrographic features.

ISOMAGNETIC MAPS

A high sensitivity airborne magnetometer survey encompassed land and water areas, gathering data for isomagnetic maps with 5 gamma contour interval and horizontal scale of 1:50,000. The magnetometer survey plane flew 1,000 ft. above the terrain, while ground monitoring stations watched for magnetic storms.

This large scale survey was carried out by AERO for the Cuban Stanolind Oil Company as part of their broad exploration program. Whether you're searching for oil or planning a large engineering development, modern AERO facilities and experienced AERO personnel can save you time, money and manpower. Get the facts from our engineers.

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Bull. Amer. Assoc. Petrol. Geol., Vol. 21, No. 4, pp. 475-490.

Goedicke, T. R. 1955, Origin of the Pinnacles on the Continental Shelf and Slope of the Gulf of Mexico; The Texas Journal of Science, Vol. VII, No. 2, pp. 149-150.

Halbouty, M. T. and Hardin, G. C., Jr. 1954, New Exploration Possibilities on Piercement-Type Salt Domes, Established by Trust Fault at Boling Dome, Wharton County, Texas; Bull. Amer. Assoc. of Petrol. Geol., Vol. 38, No. 8, pp. 1725-1740.

Halbouty, M. T. and Hardin, G. C., Jr. 1956, Genesis of Salt Domes on Gulf Coastal Plain; Bull. Amer. Assoc. of Petrol. Geol., Vol. 40, No. 4, pp. 737-746.

Harris, G. D. 1908, Domes, or Structural Peculiarities of the Salt-Bearing Localities of Louisiana and Southeast Texas; Louisiana Geol. Surv., Bull. No. 7.

Harrison, J. V. 1930, On the Geology of Some of the Salt Domes in Laristan (Southern Persia); Quarterly Journal of Geol., London Geol. Soc., No. 344, pp. 463-522.

Harrison, T. S. 1927, Colorado-Utah Salt Domes; Bull. Amer. Assoc. Petrol. Geol., Vol. 11, No. 2, pp. 111-133.

Levorsen, A. I. 1933, Studies in Paleogeology; Bull. Amer. Assoc. of Petrol. Geol., Vol 17, No. 9, pp. 1107-1132.

Martens, J. H. C. 1943, Rock Salt Reports of West Virginia; West Virginia Geol. Surv. Bull. No. 7, pp. 1-66.

Michaux, F. and Buck, E. O. 1936, The Conroe Oil Field, Texas; Bull. Amer. Assoc. Petrol. Geol., Vol. 20, No. 6, pp. 736-779.

Miller, E. T. and Ewing, M. 1956, Magnetic Measurements in the Gulf of Mexico, Geophysics, Vol. XXI, No. 2, pp. 406-432, Fig. 5.

Nettleton, L. L. 1952, Sedimentary Volumes in Gulf Coastal Plains of the United States and Mexico; Bull. Geol. Soc. of Amer., Vol. 63, Part VI, Geophysical Aspects, pp. 1221-1228.

Salas, G. P. 1955, Posibles Futuras Provincias Petroliferas en Mexico; Boletin de la Asoc. Mex. de Geol. Pet. Vol. VII, No. 3-4, pp. 81-114.

Sloss, L. L. 1951 (Abstract), Devonian Correlations in Wyoming, Montana, Alberta, Saskatchewan; Bull. Amer. Assoc. Petrol. Geol., Vol. 35, p. 1106.

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●

So many geologists and organizations assisted the writer in this task that he takes this opportunity for general acknowledgment. Paul Weaver of Houston, an internationally known geologist, recently retired from Gulf Oil Corporation and now associated with Texas A&M College, offered much help which is gratefully acknowledged. E. DeGolyer of Dallas, and his staff; Moses Knebel in New York, and his group of geologists with Standard Oil Company (New Jersey); Olaf Sundt, geologist of Florence, Italy; J. Schander, geologist for Francis Callery, Houston; Fielding Dickson, geologist with Tennessee Gas Transmission Company; W. R. Canada, geologist with Magnolia Petroleum Company, Houston; and many others, were most cooperative.

The salt dome basins and areas of bedded salt in the Soviet Union were located for the writer by Alexi Bogdanov, professor of Historical Geology in the Moscow State University. He was helpful in the outlining of the basins in Poland, Rumania and the Carpathian area generally. The author is grateful.

The errors of ommission or location must be accepted as the responsibility solely of the author. It is not intended that all occurrences of salt should be represented, only well-established marine basins and those of at least Pleistocene or older in age. Two symbols are used in the hemisphere maps; namely a 45-degree cross-hatch line to indicate bedded salt that has not been folded or forced into domes, and a double cross-hatch pattern to indicate areas in the salt basins where the salt has been sharply folded, resulting in either diapers or domes.

ERRATUM

The address of Western Geophysical Company on Page 84 of the August 1, 1956, issue of WORLD OIL was in error. The byline on the article should have read *"By Carl H. Savit, Western Geophysical Company, Los Angeles."*

What intangible difference in bits cuts most from your cost per hole?

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DRILLING PROGRESS

A Look at the Drilling Contract Industry

Here is an appraisal of the drilling contract business compiled from a survey of over 300 drilling contract firms.

By JOHN N. SCHUELKE
WORLD OIL Staff

DRILLING A WELL is still the only method for locating oil and proving reserves. Sufficient producible reserves are necessary to support our national economy and national defense. Therefore, the drilling industry is vital to our way of life.

The present petroleum reserves of natural gas and crude oil in the U. S. total approximately 35 billion barrels. These reserves continue to increase slightly each year but they are not keeping pace with the demand. U. S. production from over a half-million wells is supplemented by importing almost 1/7 of the daily demand of 8¾ million barrels.

Producing wells increased by approximately 33 thousand last year, but 37.1 percent of the wells drilled were dry. For wildcatting this percentage is higher, 87 percent of U. S. wildcats in 1955 were drilled dry. In 1954, 1056 new fields were discovered by drilling and in 1955 this figure rose to 1070.

A record 55,819 wells were drilled in 1955, with an estimated 57½ thousand to be drilled in 1956. Total footage amounted to 227½ million feet in 1955; and additional 10½ million should be drilled in 1956. Last year more than 3000 rotaries drilled 86½ percent of all U. S. wells.

Independent oil companies drilled 79.8 percent of the wells in 1955, while the 23 major oil companies drilled only 20.2 percent. This average has been increasing in favor of the independents each year.

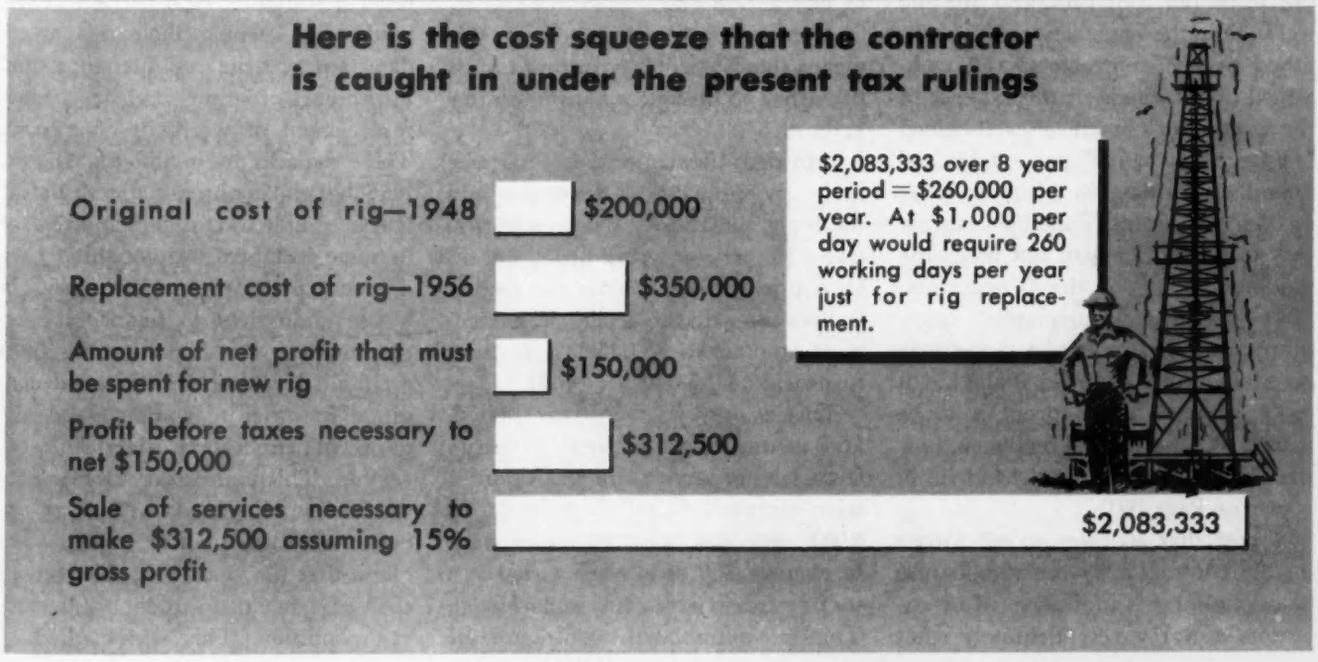
As oil becomes increasingly difficult to find, geophysical and other exploration activities are picking up. Wells are being drilled deeper each year. The wells drilled in the U. S. averaged 4075 feet in 1955 with one record breaking well going to 22,570 feet. These statistics show the increasing importance being placed on locating and proving reserves by the drillstem.

This deeper drilling is adding tremendously to the cost of finding and producing oil as drilling costs increase greatly with increases in well depth. A comparison of costs based on the 1941 average shows the tremendous economic burden placed on the contractor. While drilling costs have nearly doubled, the contractor has kept pace and penetration rates have increased by 88 percent, but the price to the operator has decreased by four percent. On the surface this is a remarkable record.

How has the contractor fared during these years of real drilling achieve-

CAN YOU AFFORD TO REPLACE THAT OLD RIG?

Here is the cost squeeze that the contractor is caught in under the present tax rulings


Original cost of rig—1948
$200,000
Replacement cost of rig—1956
$350,000
Amount of net profit that must be spent for new rig
$150,000
Profit before taxes necessary to net $150,000
$312,500
Sale of services necessary to make $312,500 assuming 15% gross profit
$2,083,333
$2,083,333 over 8 year period = $260,000 per year. At $1,000 per day would require 260 working days per year just for rig replacement.

ment? Has he become excessively rich, due to his ability to almost double penetration rates and to lower his prices in a period when every other cost in our economy has increased and where the cost of goods and services to him have almost doubled?

What does the drilling contractor think of his industry? How does he compare it with other industries? What does he think of the events that form the pattern of his existence? What is his future?

Should an industry with the accomplishments of the drilling industry be hard-pressed financially? Is it really, or is the picture as presented to the industry and to the public misleading or intentionally pessimistic?

A survey was conducted among approximately 300 contractors operating both land and water rigs, some even with foreign operations. Questions were asked concerning their financial and economic status and their management and organizational structure.

FINANCIAL OPERATIONS:

This survey covering the past eight years indicates that the contractors are definitely making less profit than they had in previous years and in a number of cases their rigs are operating at a loss. Only 5.2 percent have increased their earnings since 1948. The majority, 91.4 percent, claim to have decreased earnings since 1948. The reason most frequently given for this was an increase in the price of labor and material and a decrease in the price per foot charged for the wells. Was the enviable record established by the contractors, and mentioned above, made at the expense of the contractor's financial well-being?

Fifteen and a half percent blamed unrealistic bidding as a major cause of their lost profits. Tangible costs are easy to figure in a bid, but when the bidding is close to the fringe costs; office overhead, depreciation, taxes, insurance, etc., must be accurately ascertained and included if the bid is to be realistic and a profit is to be made. W. K. Powell explains how these fringe costs affect the bid in an article on Page 160.

A cost that is more or less forced on the contractor by the very nature of his business is insurance. Most operators specify very definitely what type of insuranee they expect the contractor to carry so that all operations are fully insured against loss or liability. While these costs are not new to the contractor because of the AAODC cost accounting training classes that a great number of contractors and their key personnel have taken advantage of, these costs still must be included in the bid as a day to day expense. As the risks increase so should the amount of insurance coverage. In this way the contractor can share his risks with the insurance company. The different types of contractor's insurance and what they can mean to an operation are described by George I. Terrell on Page 165.

Equipment depreciation is another intangible that has considerable effect on bidding prices, especially when it becomes necessary to replace equipment. Depreciation for tax purposes must be figured on the initial investment, but for bidding purposes an amount is usually calculated from current inventory evaluation. The difference in the depreciation account and the current replacement costs must be made up from net profits after taxes. This difference brought on by spiraling costs places a tremendous burden on the contractor.

Figure 1 is a comparison of the cost of a deep drilling rig in 1948 and the replacement cost of the same capacity rig in 1956. The original cost can be recovered through depreciation and salvage, but it will still be necessary to provide $150,000 out of net profits to buy a new rig.

At a tax rate of 52 percent this means that $312,500 gross profit must be earned to provide a net profit after taxes of $150,000.

Provided the contractors expenses and costs of operations are in line and assuming that he is asking—*and getting*—15 percent gross profit on his total price before income tax then it is necessary that his sale of services must amount to $2,083,333 in order to provide $150,000 net profit.

This is over an eight-year period, and means that the total revenue from sales of services for this rig must have averaged $250,000 per year. At $1000 per day this rig would have to average 250 days work a year just to provide funds for replacement. This does not allow the contractor one penny to take home, and holds true only if his operating expenses are in line and he is able to add 15 percent for profit to his bids and still receive the bid.

A few contractors blamed an over-supply of rigs. In some cases this over-supply was due to obsolete and inadequate equipment being available for bidding.

When a rig is traded to the supply stores for replacement, the supply stores apparently have been all too willing to advance credit and sell these second-hand rigs to interested parties at a low intitial down payment. This second-hand rig can be obtained at a considerably lower price than a new piece of equipment and is probably in competition with the man who has just replaced it due to its obsolescence. Most of the contractors talked to would prefer that these second-hand rigs would trade at a little lower value, but then be scrapped by the supply stores rather than resold and placed back in the drilling business. This would take obsolete and in some cases unsafe equipment from the market where it is helping to drag down the price and add to the instability of the contract business.

If operators demand good rig iron and in some cases all the extras, they should be willing to pay a premium for this better rig.

An overwhelming majority, 84.7 percent, claim to have maintained their rigs in an up-to-date manner where they were competitive with other contractors. 62.8 percent attributed their keeping their rigs up-to-date to a strict maintenance and inspection program and to proper replacement of worn-out equipment. These remarks are qualified to the extent that the contractor stated that he had been able to maintain and replace in some instances by ploughing back a higher percentage of his profits or by going in debt to finance the replacement cost. A contractor must maintain his equipment in good condition in order to compete and also to maintain a safe plant to work around. This is necessary from an insurance standpoint, as well as an operational standpoint. 15.3 percent claim that they were not able to keep their rigs in an up-to-date and modern condition. This was blamed 50

percent on the price per foot for the wells being too low and 50 percent on replacement costs being too high. Here again it appears that an enviable record was made at the expense of the contractor.

Many contractors who had successfully replaced equipment, remarked that they had not modernized their rigs to the extent that they would like, and that this added investment was not justified as long as the equipment on hand was serviceable and able to do the job. This could be an indication of why revolutionary new drilling rigs have not appeared on the market.

A frequently heard remark is that with present equipment the contractor has reached his limit of efficiency and absorbed all of the penetration rates possible. Does this mean that present rigs can no longer be modified at small cost to increase efficiency and afford further savings?

According to one drilling supervisor (see G. C. MacDonald's article on Page 168), there are still quite a few modifications that can be made to the present standard equipment to increase a contractor's efficiency.

How have these maintenance and replacement costs been financed? To whom does the contractor turn when he is in need of financial assistance? 71.2 percent borrow money either entirely or partially from banking institutions, while 44.1 percent receive some part of their financial assistance from supply stores. Only 20.4 percent have private financing and a good portion of this comes from owning their own production. A fairly high percentage, 42.9, claim that it was quite easy to obtain the necessary financing while an even higher percent, 49.0, claim that financing was relatively difficult. Those who found financing rather easy could qualify it by saying that they had sufficient collateral, such as their own production, or accounts receivable. Those who found financing difficult usually were only able to put up their rigs as collateral.

A realistic approach to acquiring a new tool that is to make money for its owner must be taken. As in any other industry, the value of the tool is only as high as the return that its operation can bring. A drilling rig while valued at a quarter of a million dollars is not worth that to the contractor or anyone else unless it can make him a quarter of a million dollars plus all operational costs and a fair return on his investment.

If a guarantee of continued work can be made at a rate that would guarantee repayment of the loan, this is as good a collateral as any financial or lending institution could ask for. For an elaboration of the subject to financing for the drilling contractor read Harold Vance's article starting on Page 179.

Some contractors believe that the risks were too high and the unsound conditions of the drilling business as a whole did not make it a very good financial risk.

Rates of interest and terms of repayment of loans varied widely. Still 66.7 percent of the contractors considered the terms of their loans lenient and justifiable, while only 29.4 percent considered these loans too harsh. A 3.9 percent considered them average and in line with other business transactions.

PERSONNEL:

As in any industry, the contractor's organization is only as good as the men who run it.

How much thought is given to personnel in this important segment of the petroleum industry?

Do you have the type of men on your drilling crews that you want?

What must their qualifications be?

What has been done to upgrade and train the men in your organization?

Twenty percent of the contractors have indicated proper training was a big factor in holding on to good personnel. Training programs are being sponsored not only within some companies but by the American Association of Oilwell Drilling Contractors as well. The contractors are availing themselves of every opportunity to upgrade their personnel to fill more responsible jobs in their future organization. This is a necessary step due to the increasing technology of modern drilling practices.

In fact, 73.7 percent of the contractors surveyed stated that they believed engineering or technical assistance was necessary in today's drilling procedures and practices. Most of the larger contracting firms have availed themselves of engineering know-how and it is paying dividends. As an example of how one company has organized, trained, and assigned duties to their engineering personnel read the article starting on Page 182.

Only 26.3 percent stated that technical assistance was not necessary and most of these based their answers on the fact that they were small and could not afford the additional overhead, or that because they were small contractors a good practical drilling man was more of a necessity than a man versed in the technologies of mud, pipe, and bit programs and the mechanical efficiencies of a rig.

The contractor should take every occasion to increase the efficiency of his crews as it will drastically effect the efficiency of a rig and thereby the successful bidding on a well.

CONTRACTUAL RELATIONS:

If properly organized, with good credit rating, good equipment and well trained, experienced and enthusiastic crews why should a contractor fail to make money? Are there outside influences or conditions that detract from his efficiency? What are these factors and what can be done about them.

To begin with, 68 percent feel that the present contracts place too heavy a responsibility for the risks involved in drilling on the contractor. The objection is not the risks, as such, but the lack of compensation for taking these risks.

Figure 2 itemizes the more common and prevalent complaints of the contractors in the order of their frequency as noted on the survey. These points show where the majority of the contractors agreed that change or improvement was needed. Most of these can only be resolved by mutual understanding and cooperation between the parties involved. Here the contractors have a selling job to do on the operators. Their business status must be explained and the operator must be made to listen in the interest of a sound and stable drilling industry. For a further discussion on how the operators can aid the contractor in the better performance of his job read the article by Morris McDannald on Page 186.

However, the picture is not entirely one sided. The contractor by his own

CONTRACTORS REQUEST OPERATORS TO:

1. Adopt more long-range planning.
   a. Limit number of bid solicitations.
   b. Stop requiring a new bid for each well in an area.
   c. Respect quality of equipment and contractor's drilling ability.
   d. Use equipment in area—decrease moving costs.
   e. Give multi-well contracts to successful bidder.
   f. Allow adequate time between contract and spud-in date.
   g. Prepare roads, location, etc., well in advance of rig moving date.
2. Have closer liaison and cooperation with contractor.
   a. Use contractor's experience in well planning.
   b. Have all operator's field personnel familiar with contract terms
   c. Stop educating engineers and geologists at contractor's expense.
3. Include well prognosis in bid solicitation.
4. Allow contractor compensation in proportion to risks.
   a. Acceptance of lowest bid beats footage and day rates down.
   b. Assume some of risk on:
      (1) Hole deviation
      (2) Lost circulation
      (3) Running casing
   c. Renegotiate on problem wells.

FIGURE 2

admission is not free from blame for the state of affairs as they exist today. Cut-throat bidding practices, break even contracts, poor accounting practices, and unrealistic bidding have placed many contractors in financial predicaments. The operator has no doubt benefited from these practices of the contractor, and while they would like to see the contractor make a reasonable profit it is not their place to tell the contractor what his costs are and how he should bid on the well. An operator's appraisal of the contract situation is explained by S. C. Oliphant on Page 195.

Full cooperation and mutual respect is necessary to obtain full benefits from operator and contractor relations. This must start with the operator as he is the one with the money, the work, and the say so on who gets the bids. He must be educated and encouraged to understand the position of the contractor. He must understand that it is not just a question of running his own business but he must plan his work so as to enable the contractor to plan his. Here long range planning of a well prognosis will go a long way toward helping the contractor. It will enable him to plan his work, stop worrying about keeping his rigs busy, and enable him to concentrate on doing a better job, faster.

Proper planning of a well and a good well prognosis calls for full cooperation and liaison not only between the contractor and the operator but also between the various departments of the operators organization. To see how a well prognosis is drawn up and how many people must be consulted and delegated a responsibility read H. L. Strider's article on Page 196.

There is no doubt in anyone's mind that this advance planning pays off in higher morale, better work and in actual dollars and cents. As one instance of where proper and thorough planning by the operator paid rich dividends read the article on Shell Oil Company's development of the Elk City field starting on Page 210. Here contractors and operator alike were enthusiastic in their praise of the results from this type of advance planning. That it was successful should be an incentive to all concerned to work toward a similar goal in their dealings with other contractors, and in their business deals with operators.

CONCLUSION:

Judging from the survey and numerous discussions two main features seem to stand in the way of the contractor stabilizing his business on a sounder, economic footing. These are:

- Lack of assured steady work, and
- Inability, due to competition, to pass increased costs on to the operator.

With the present factors governing the actions of the operators it is a slow process to remedy the unfavorable aspects of contract drilling. A solution might be in negotiated contracts or in affiliation with a producing company. Here an active drilling program would assure the contractor of at least keeping his rigs busy with most of his profit coming from production acquired through drilling ventures.

The negotiated contract would also help to solve the second item above because these are usually cost plus contracts. These are not easy contracts to come by and some of the contractors frankly don't want them. They are usually available only to reliable and reputable contractors who have proved their drilling prowess in the past. Regardless of the type of contract the contractor will have to honestly figure his total costs, tangible and intangible; add a reasonable and fair profit percent and pass this bill on to the operator. Only by adhering to this practice of honest, realistic bidding, and refusing to take break-even contracts can the contractor hope to stabilize his business. The operator is the only source of money in the business so he is the only one that can absorb the spiraling costs of labor and materials. If he is approached in the proper manner and presented a clear picture of the driller's cost accounting he must be willing to accept the increased costs—sooner or later.

—**The End**

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August 13, 1956

Wilson Manufacturing Co.
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ATTN: Mr. John Wilson

Gentlemen:

RE: Our telephone conversation, several days back on performance of the Super Titan "56" Rig purchased from you in October, 1955.

This equipment was placed in service on our drill barge #1, on November 29, 1955 and thru June 30, 1956, the equipment drilled and completed 14 wells, 4 of which were completed as dual producers.

The average depth drilled was 9000'. Total days elapsed time 215. Total time used for completing wells, after casing was run and tubing picked up, 86 days. Total time moving on location, drilling and running casing and picking tubing up was 129 days.

With the above record it should not be necessary for me to point out that we have had very little lost time on equipment, and that we are completely satisfied with this new type Wilson rig.

Yours very truly,

REBSTOCK & REEVES DRILLING COMPANY

R. H. Reeves

Mr. R. H. Reeves (left) and Mr. John Wilson of Wilson Manufacturing Co. stand on the floor of the Rebstock and Reeves Barge No. 1 during recent operations.

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Fringe Costs Must Be Considered

They may represent the margin of profit.

By W. K. POWELL, president
Beard Drilling Company
Duncan, Oklahoma

DURING WORLD WAR II, in the midst of prosperous competitors, there was a single powdered egg factory losing money. Why this one factory equipped and engineered as well as the finest should be unprofitable was an economic mystery. Accountants and auditors checked and rechecked its expenses and income. Engineers, egg drying experts and just plain working men swarmed the plant seeking an answer to the riddle.

There were no aberrations in its working technique, no variations in buying, marketing or processing to account for the sustained losses. Management was in a frenzy approaching surrender when an investigator thought to check the dust of adjoining roof tops. There he found unmistakable traces of powdered egg. This clue led to a tiny leak in an exposed conveyor duct at the top of the plant. This leak, so tiny that it had not been apparent to the many who had examined that section of conveyor duct, was the cause of the losses.

Powdered egg escaped minute by minute, hour by hour through this small aperture into the open air of the roof where it was dispersed by wind and exhaust fans into the atmosphere of the neighborhood. An invisible stream of egg dust for eight months had spewed the profits of this plant to the elements to be lost forever.

Drilling contractors are in the same position today as that egg drying factory was. With a feverish earnestness, that was considered unmanly in the long lost lush days, contractors are hunting out the leaks and stopping up the holes that threaten their economic life. There is currently a widespread appraisal of the small costs of drilling that have heretofore been considered too insignificant to warrant attention. Because of the extreme pressure of low unit income the control of fringe costs has become vital to the contractor. Margins have become so thin that expenses as small as fuel evaporation could literally be the difference in profit and loss.

Direct Costs Recognized. Most contractors are intimate with their direct costs. They know better than anyone else in the world what their labor, supervision, supplies, bits, hauling, repairs, maintenance and other direct expenses require in dollar outlay. Under the leadership of the American Association of Oilwell Drilling Contractors there has been a great advance in the degree of understanding of drilling costs. Accounting departments have been geared to faster and more accurate methods of obtaining and reporting costs to management. Consequently most contractors—those that will survive—have adequate knowledge of their direct expenses in total and in detail.

Indirect Costs Require More Study. It is in the area of indirect costs that the contractors may need to expand and intensify their quest for more accuracy. The estimation of depreciation and obsolescence must move from generalized guesswork to controlled measurement. Using the records of past business history, numerous companies are analyzing the rate and amount of depreciation and obsolescence actually sustained by various types of equipment. With calculated adjustments, required by such factors as price increases and changing character of work, the results of these studies are being applied as most realistic measures of indirect expense.

How this is done is simply exemplified by drill pipe depreciation studies. From beginning to end, the life history of strings of drill pipe are charted. Starting with the original cost of the drill pipe and adding major improvements and additions, such as new joints and hard banding, the total cost of the pipe is obtained. From this figure the salvage value of the pipe, at the time of retirement, is deducted to secure a net total cost. Total work units are compiled from use history. Frequently, the unit selected is the foot-day. There is some degree of error experienced in obtaining foot-days in the practical difficulty of calculating fractional days for each particular foot. The practice is to assume the total footage in the hole for the entire, or portion of a full, 24-hour work day to be the total foot-days accumulated for that particular day. The total of all such foot-days produced by a string of drill pipe to retirement enables the contractor to find the unit of depreciation expense, for a single foot-day through the simple expedient of division of this sum into the total net cost.

The failure, or inability, to develop realistic depreciation expense factors can seriously impair the contractor's success in bidding and obtaining profitable work. Since there is a general feeling that depreciation expense is theoretical, to some degree, there is a tendency to discount its reality. In preparing an estimate the contractor says, "Well, I suspect we have too much in for depreciation. Let's shave that a bit and maybe we can get this job." Now, if he is wrong, an invisible leak is created for the dissipation of profits. It will not become apparent until serious damage has accrued to the financial structure of the patricular company. Even then it may puzzle management as to why losses have been sustained when *each contract* was on a profitable basis.

A similar condition occurs in the application of Overhead Expense to estimating the bid. Contractors are prone to use a round figure to represent the cost per day for well drilling. Often, using prior years experience, a per day cost is obtained by dividing total yearly overhead expense by the total drilling days. The result is almost always an odd figure extending

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MODERN HEAVY-DUTY OILFIELD ENGINES

many times into a multi-decimal. But the contractor converts it to a handy factor on the basis of the nearest round figure. Hence such figures as $80, $100, $75, or $125 per day for overhead.

When close tolerances were not necessary for estimating this was good practice. But today the pressure of close margins demands more accuracy. Not only must the exact factor of cost for overhead expense be established on the basis of experience, but it must be adjusted to current conditions. The increase in competition itself may require a weighting for the increased expense of obtaining contracts. Other rising costs may need to be considered. Or increased volume may have reduced the per day cost. The detection and application of decrease trends is fully as important as prompt attention to increases. The ability to obtain contracts, under the bidding system, is governed by very small variations in expense today.

Per Day Profits vs. Yearly Profits. Under high pressure enthusiasm for per day cost factors the importance of the year as a whole may be overlooked. In a critical analysis of drilling costs to support realistic bidding there must be a very careful relation of unit costs to the total yearly results. Minute variations in calculated unit costs can become highly important in total. Five dollars per working day when applied to ten drilling rigs operating an average of 200 days is $10,000. A single variation amounting to $5 may be easily spotted, but 11 cents here, 21 cents there and 18 cents contribute to 10 percent of $5 without notice. Consequently, it behooves the contractor to deal in actual fractions when it is necessary to approach reality.

On paper, it may seem impossible, at times, not to make a profit for the year. If every contract is taken on the basis of cost factor figures plus a profit, the end result should be a profitable year. Alas! It isn't always so. And management is properly irritated. The accounting department is frequently berated for providing "bad" information. The operating department is excoriated. But the cost information may be proven to be "good" and the drilling efficiency excellent. Small leaks caused the trouble. Plus misunderstanding another influence.

Break-Even Point. In the making of bids, it is customary to add to the estimated costs some profit based on a percentage relationship to the complete well cost or to the per day cost. A false assumption is often made that if all work is taken at a price which includes a calculated percentage of profit that the annual profit figure will be of that same percentage. When it is not, efforts are made to reconcile the estimate with reality by subscribing the variation to fluctuations in operating efficiency or to improper original cost factors. Only in unusual cases and by coincidence will the yearly percentage of profit be the same as that applied uniformly to all work contracted.

This occurs because the yearly results are vitally affected by the average volume of work performed by all rigs. Assuming that no errors have occurred in the calculation of unit cost factors based on previous experience it must be noted that such cost factors are only true in a very limited sense. That portion of the expense factor which is directly related to a cost unit basis—as labor or rig maintenance is to the rig operating day—may, with price corrections, be applied quite accurately. The number of days of operation will scarcely affect these unless there is a change in operating policy. But, all of the indirect expenses are related in varying degrees to the actual number of days involved in isolation of their unit cost.

The indirect expenses of depreciation, obsolescence and overhead tend to become fixed in amount per year. This necessitates the recognition of the break-even point or the time in accumulated drilling progression at which the total income will exactly balance all of the yearlv expenses. Income for the year starts at zero and progresses to a maximum of 100 percent. Expense, on a yearly basis, begins with the total of those costs that are fixed for the year and that will have to be met regardless of the amount of work done and ascends with the increase in operations per time unit. The time at which the volume of operations produces a condition of exact balance between income and expense, as represented by total fixed expense plus variable operating expense in that period, is the break-even point.

The significant thing about this is that it helps to explain why the profit expected from the application of a uniform percentage of gain to each contract is not the same for the year. Assume that a contractor applies and earns 10 percent on each contract taken. Further assume that at this rate he reaches the break-even point beyond which yearly profits will accrue at an average of 200 operating days per rig. It then becomes obvious that the rigs must continue to work until they have each worked 365 days in the year to produce an annual profit of 10 percent. As this is practically impossible it follows that the annual net profit will be something less than the mark-up of 10 percent and the exact amount will depend upon the average number of operating days under average sustained conditions.

Just a brief examination of this principle indicates that the "fringe" costs that the contractor must consider are much more complex than they appear. And influences such as the break-even point are so important that they cannot be ignored during a period requiring the very best in realistic bidding.

Influences Affecting Costs. The nature of the many expenses involved in drilling an oil well expose them to fluctuating influences which the contractor must recognize in the refinement of his cost figures. There are many obvious factors which alter costs. The location of work, weather, time of year, available labor, available supervision, contractual requirements, depth, terrain and many others are familiar to the contractor. Allowances are made for deviations from the conditions on which his cost figures are based. Whether these modifications are accurate or not depends on the contractors experience and judgment as recorded and supported by specific cost studies.

As indicated above, the volume of drilling has a strong bearing on both unit and over-all costs. Most contractors are prone to be very over optimistic regarding their work expectations. The tendency is to remember the rigs which had good runs during the year and consider this to be the average operating time for all rigs. Statistics on this subject are easy to obtain and should not be overlooked in any program to improve drilling cost analysis.

In the fertile field of influences on drilling costs there are many that have had little thought or study. Scientific

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methods applied to the measurement of cost variations due to these forces could produce some important reforms in bidding. No contractor today knows how much graduated changes in operating policy will affect costs. There is no accurate table of cost differentials in working for different operators under supposedly identical contractual conditions. No statistical reports of the hazard costs in specific drilling areas are available. Yet all of these are reflected in dollars and cents of expense.

Other Fringe Costs. For the practical contractor, there are other, less subtle, edge costs that deserve a second look. Some of these costs may be eliminated or reduced. Others have increased. And it is these fluctuations in total which could alter decisively the elements constituting the bid.

It is possible that the expense of obtaining and maintaining work connections may have increased more rapidly than is assumed. Certainly, during periods of intensive competition greater effort is required to obtain contracts. This means that there are more calls to be made, more miles to be traveled, more meals to be shared and more entertainment to provide. Many companies have employed additional "contact" men and other increased expenses to secure work. On the other hand, there seems to be a marked decrease in the frequency of large "gifts" and a virtual cessation of outright payments for contracts.

There are, as indicated above, material differences in the results of working for different operators under the same contract stipulations. This fact has been well known among contractors for many years yet there has been no formal recognition of the difference. It should be done and the companies should be made aware of it so they may understand why prices of drilling should vary. A careful analysis of this situation may reveal that under a realistic bidding program it will be possible to make a profit on some work that surface-wise appears low in price.

The amount and cost of supervision needs greater scrutiny at the present. The drilling industry has evolved from a war period requiring increased numbers of supervisory personnel to a period in which a normal supply of skilled drilling crews may make some quantity of supervision superfluous. Recalling that quality is more important than quantity in running tools, the contractor may discover that there is a place for revision in this expense category.

Some contractors are over-organized. There is a multiplicity of administrative and executive employes with overlapping duties. With an intricate organization the expense of being over-staffed is augmented by the increase in communication cost. Organizational charts used in connection with cost studies will reveal the fringe costs that must be accounted for. The additional expense must be recognized in computing bids or corrective action taken.

An examination of surplus costs should not overlook active expenses resulting from excess entertainment of company employes or uncompensated rig site expenditures for company personnel. The latter is a particularly noteworthy item in remote locations where lodging and meals must be provided by the contractor. Visitors, also, make inroads on the cash box through this attraction. Most offshore operators have recognized this added expense by warning visitors that they will be expected to pay for all meals at a posted rate. But a certain amount of additional costs of this nature may be unavoidable and must be measured into the bid.

The cost of owning special equipment is often overlooked. In the yards of most contractors there are pieces of machinery that cost good sums of money waiting to be used again. This equipment was purchased to meet a special need—the requirement of a particular operator or the needs of an unusual job. All of the costs that were not repaid by the specific job for which it was bought must be recovered. There is also an amount of "float" material in the form of specialized tools or common tools that move from rig to rig that has to be paid for. This can only be recovered as additional depreciation and must be added in some equitable manner to the obtainable contracts. To ignore this expense is to dissipate profits.

While analyzing equipment costs it is well to make allowance for any unusual wear and tear or accelerated depreciation that may be anticipated. An ordinary example is the use of a rig for work beyond its rated capacity in an emergency. Or the requirement for unusually strenuous and lengthy daywork operations at maximum depths. They will make a difference in the real cost of depreciation.

Specific contracts occasionally create additional charges that should be recognized in bidding. For example, long term footage contract work may impose an additional financial expense. The contractor should be reimbursed, through gross profit, for interest on the outlay of all money invested in the well up to the time of payment. This he recognizes in his measure of profit requirements. But if there is to be a longer waiting period than usual the financial expense increases and should be considered as an additional expense or as an increase to profit.

Fringe costs cannot but remind us of fringe benefits. These additional payments to employes have increased so gradually that they have not drawn much attention until lately when their total has been recognized. It has become apparent to some contractors that the fringe benefits they have provided for employes has put them at a decided disadvantage in bidding against contractors who offer few or no such inducements. The apparently innocent and, certainly, well intentioned insurance, retirement and vacation expenses provided by some employers have multiplied into such significant sums that these contractors are in a predicament. In a peculiar drama of frenzy it has been seriously suggested by some that the embracement of unionism is the path to equalization of these costs. There are other and more sober plans afoot, but they both represent a new trend among drilling contractors.

Active and Corrective Analysis. There is extreme interest, in the drilling contracting world, in a reexamination of all drilling costs. There is particular emphasis on the more obscure and intangible elements of cost. Activity in management circles indicates a pincers movement is afoot in the form of active and corrective analysis of drilling expense for bidding purposes.

For the immediate purpose of formulating bids every item of cost is under close scrutiny. The methods of collecting the information are being examined. The theories of allocation and

distribution of expenses are being reappraised. New ideas on cost determination are being sought. And all of this constitutes an active analysis of the present drilling costs for the purpose of facing competition more intelligently.

The second phase, referred to as corrective analysis, is being conducted to find activities that may be altered to reduce expense without sacrifice of efficiency and utility. In a sense, these studies may be regarded as by-products of the primary objective of investigation and refinement of drilling costs. Conditions are revealed which will respond to improvement thus creating a situation wherein the cost is not only accurately surveyed but is altered as a result of the analysis. As an example of this type of action, power tools may be seen replacing manual labor on rigs. Automatic drilling control devices are aiding in reducing crew numbers.

The major direct costs of drilling are widely recognized and wisely controlled. The emphasis now is on the determination of indirect and related expenses. In the fight for survival management is whetting its efficiency and whittling away at the few remaining vulnerable costs. This is a time when fringe costs have become vital to realistic bidding. Success in the drilling industry is going to depend on the control of this fringe from now on! —**The End**

Are Your Risks Insured?

Let the insurance company share the risks, but include the premiums in the bid.

By GEORGE I. TERREL
Cravens-Dargen Insurance Company
Houston

FEW INDUSTRIES employing the independent contractor present more problems involving mechanical failure, human failure, and natural hazards than those faced by the drilling contractor.

What can he do about these risks or hazards? First, he can assume the risk and do nothing about it, and assume some of the chances of loss. Second, he can eliminate the risk by discontinuing some practice that produced it. Great strides have been made by the drilling industry along this line in safety and accident prevention work. Third, he can eliminate the most objectionable features and pass the risk on to a professional risk bearer such as an insurance company.

This article is concerned mainly with the types of insurance available to the contractor. Following is a list of what generally are considered to be the requirements of an insurable hazard:

1. The units, that is risks, to be insured must be numerous enough and homogeneous enough for the proper application of the law of large numbers. If this is not true then the insurance industry cannot hope to collect enough premium from enough risks to pay the losses of the few who have them.

2. The loss to be insured against must be of a kind that is definite as to time and place and important enough to constitute a real risk to those exposed to it.

3. The hazard insured against must be of such a nature that loss would be accidental and fortuitous, that is, beyond the deliberate control of the insured.

4. The risks must not be of such a nature or so concentrated that there would be danger of a single loss or connected series of losses constituting a catastrophe to the insurer.

5. Extent of the risk must be measurable.

Most insurance companies do apply most of these requirements whether knowingly or not. A non-admitted insurer can and does disregard requirements 1 and 4, and the drilling contractor often is able to obtain insurance against the unusual risk and against those beyond the capacity of the American insurance market.

The types of hazard, or chance of loss, which are most readily transferable to the insurance underwriter are as follows:

1. Injury or death of an employe may be insured against with **Workmens Compensation and Employers Liability.**

2. Injury or death of a member of the public is provided by **General Liability** including **Automobile Bodily Injury.**

3. Loss of money or property through infidelity of an employe or agent is properly insured by a **Fidelity Bond.**

4. Injury or damage to the property of third parties requires general liability and automobile property damage and in some cases owners or contractors protective liability. At times the contractor may require high limits property damage coverage to protect against claims arising from damage to property of third parties as the result of a blowout and/or crater. While sufficient limits of protection are not available usually from American insurance companies, it can be provided by a non-admitted insurer.

5. Insurance covering total loss of the contractor's rig is discussed later.

6. Insurance against liability which the contractor would not have had except for having assumed it in a contract is called contractual liability. Type of such liability that is assumed as a result of the hold-harmless agreement which appears on the reverse side of work orders of specialty contractors such as well cementers, well loggers, fishing tool suppliers, etc. is readily obtainable.

7. Reimbursement insurance for additional cost to regain control of a

well which has blown-out, cratered, or caught on fire is obtainable.

Physical damage coverage to the rig itself is readily available. Perils commonly insured are fire, lightning, tornado, cyclone, windstorm, hail, explosion above the surface of the ground, collision, derailment, overturn of the transporting land conveyance while in transit by railroad, railway express, and/or motor truck. Coverage also includes marine perils while being transported on a regular ferry line, collapse of bridge or culvert, blowout and/or cratering.

Coverage against additional perils also may be purchased such as flood, aircraft, strikes, riot, civil commotion, vandalism, malicious mischief, loading and/or unloading, theft, (but excluding mysterious disappearance, inventory shortage, infidelity of employes) the raising and/or lowering of a cantilever derrick or mast, and the pull-in of the derrick or mast.

The policy contains a blowout preventer warranty. This means that if failure to have a blowout preventer properly installed and tested causes loss or contributes to loss, then the loss cannot be paid by the insurance carrier.

The policy will contain a coinsurance clause. Application of the coinsurance clause causes a certain amount of difficulty and it would be well to give some explanation of this clause.

The formula might be expressed as follows: The amount of insurance actually in effect divided by the amount of insurance which the assured shoud have had, that is, say 100 percent of the actual value, times the actual loss would indicate the amount of insurance recoverable, provided of course, that this does not exceed the amount of insurance in force.

All underwriters experience difficulty in explaining to the drilling contractor that the fact that he was able to go out and purchase a used rig complete does not mean that that purchase price necessarily is the actual value of the rig for insurance purposes.

Actual value of the rig for insurance purposes is the cost to replace every article of the rig in a new condition, plus cost of assembly, plus cost of transportation to the scene of accident, reduced by depreciation however caused.

With the exception of steam rigs, or those portions of steam rigs which actually are operated by steam, such as the drawworks, pumps, light plant, etc., if a rig is depreciated more than 20 percent or 25 percent it is not believed to be in a usable condition. If the contractor insists on a very large percentage of depreciation on the entire rig in an effort to keep from being too great a self insurer, then he also reduces the amount recoverable for the articles lost. This is because the same average rate of depreciation must be applied to every article of the rig.

If a rig has a sound value for insurance purposes of $300,000 and this rig is insured for $150,000, then ordinarily only one-half of any partial loss can be expected to be recovered.

The fact that the contractor may be fully aware of the under insurance and his exposure of having to pay a great portion of partial loss does not necessarily make the risk an acceptable one to an insurance company. It is a known fact that unless premium is collected on just about 100 percent of value on all rigs insured, companies will not have a sufficient amount of money in their possession to pay losses, plus the overheads of the insurance business, and still make a profit.

Several years ago one of the largest markets for the writing of rig insurance had to go out of existence because it had all rigs insured for about 50 percent. This then meant that if they had a loss ratio which would have been say 60 percent on a 100 percent of value, then it was over 100 percent on the amount for which they actually had the rigs insured.

Theft coverage has become a problem to the insurance companies and the insuring of this peril may have to be discontinued. Certainly no insurance carrier could insure mysterious disappearance or inventory shortage on equipment which is left out in the open quite often unattended by a watchman.

The peril of pull-in of the derrick is causing a great deal of difficulty at the present time. It, too, may have to go on the prohibited list. It is a recognized fact that no driller would knowingly pull in the derrick, but, in the heat of the moment when the drill stem is stuck, he may place excessive strain on the derrick and jerk the drill stem thereby adding shock to the constant strain and causing failure of the derrick.

So far as is known there is no market for so-called stuck drill stem, twist offs, loss of circulation, gradually increased flow of circulation such as hot salt water flow, cavities, etc. This is a trade loss which must be assumed by the drilling contractor.

This possibility must be taken into account in the contract price to the operator so that the contractor will have sufficient funds in his possession to replace the drill stem if the loss occurs in such a manner. Or he simply must place this risk upon the operator in those areas where it is likely to happen.

Contractual liability can be obtained by the drilling contractor, but probably not broad enough to take care of all risks he might assume under the hold-harmless clause which appears in some contracts. Fortunately for the drilling contractor most jurisdictions will not let all of the negligence of the operator be saddled on the contractor. To do so is believed to be against public policy.

No attempt will be made to advise the contractor on matters that he should take up with his attorney. Contractual liability is looked upon with suspicion by most insurance companies and certainly will call for sizable premiums if the insurance carrier is going to pick up every type of liability which the contractor might assume. To attempt to go into this matter further would be too lengthy.

When the contract is on a turn-key basis, the contractor is exposed to the possibility of sizable additional cost to regain control of a well which has caught fire, blow-out or crated. Insurance against this possibility is available and is called "cost of regaining control of well."

The insurance simply agrees to reimburse the assured for expenses involved for additional mud, chemicals, additives, well cementing, fire fighters, and directional or relief wells made necessary to regain control of a well that has caught fire, blown-out or cratered. The deductibles applicable usually start at $5,000.

Usually, the drilling contractor only carries modest amounts of third party property damage coverage for damage resulting from a blow-out or crater. Particularly in the case of turn-key wells, it is believed that the contractor should obtain quotations for insurance against damage, not only to the sur-

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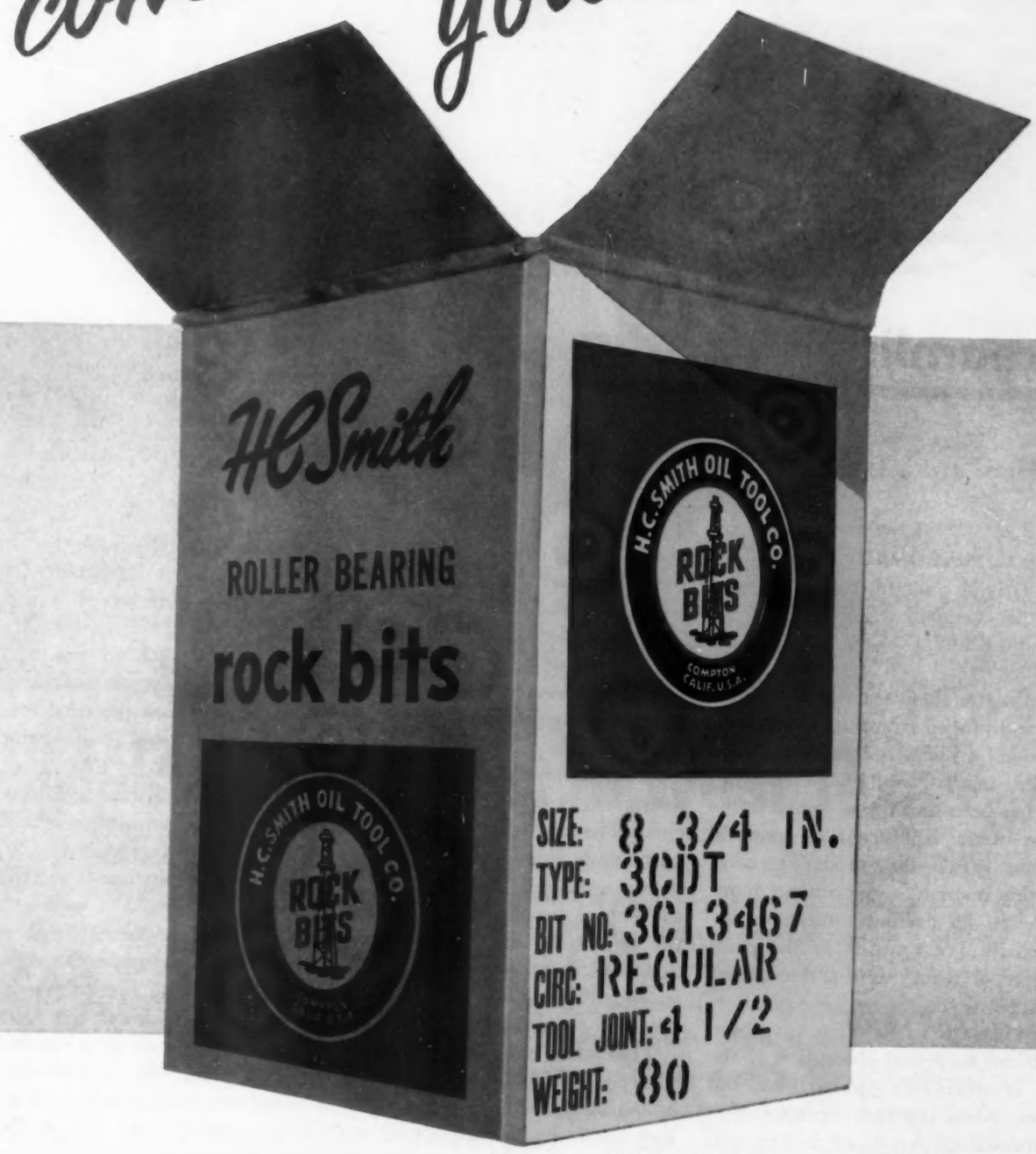

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face of the ground, but also to underground property such as structure, formations, wells, minerals, etc.

Until recently it was possible for the contractor to purchase insurance against the loss of the well itself if lost due to a blow-out, crater or fire. However, this coverage was only available through a non-admitted insurer and this firm does not care to insure any further risks of this sort. This came about not only because their experience has been quite disastrous but also because they feel that it is an operational hazard or trade loss.

At some later date there may be a market, but it is not going to be possible for the insurance to be used in the place of protective strings of casing. Also, the definition of blow-out must describe only a blow-out and not extend to such things as reimbursing for the cost of a well which is abandoned because of excessive pressures or prospect of salt water.

Some of these insurance policies must be kept in effect at all times. Their annual premium therefore must be prorated to each anticipated working day. This prorated amount then is considered in each bid on a daily basis.

The other or special policies are taken out only for the duration of a well and to cover special conditions presented by the drilling risks, or are taken out at the operator's insistence. Premiums for these insurances are to be charged directly to the well in question and, therefore, are part of the bidding price.

In some cases these premiums may seem small and insignificant on a daily basis when compared to the over-all drilling costs, but as long as they are in force and must be paid they constitute a real cost and must be included in any realistic bid.

Streamline Your Rig and Save Money

Here are a few ideas for lightening the load and saving on transportation.

By G. C. MacDONALD
Area Drilling Supervisor
Gulf Oil Company
Wichita, Kansas

EXTENSIVE DISCUSSION of utilization and proper arrangement of existing rotary drilling equipment has been carried on, but very little consideration has been given to a complete revision of the equipment to adapt it specifically to drilling needs. The need for this revision is becoming more acute as the drilling contractors increasingly are caught in the price squeeze of rising costs and constant revenue.

Profits in the past often have been sufficient to permit absorption of the cost of inefficient operations, but today, when contract footage prices in specific areas are no higher, and often less, than contract footage prices of 1940, the unnecessary cost of poorly designed equipment can no longer be tolerated. The time has come to look critically at the equipment used in drilling, rather than at the manner in which existing equipment is assembled and used.

Full potentialities of slim hole drilling cannot be realized until drastic equipment revision has been achieved. In fact, the need for revision is largely pointed up by the advent of slim hole drilling.

As an obvious example of this, the dimensions of an engine could be cited. The length of an engine is not particularly significant when that engine is used on a big hole rig because the engine usually is removed from the rig, often with its output shaft, and hauled lengthwise. The engine, its clutch and output shaft often are mounted on a single skid.

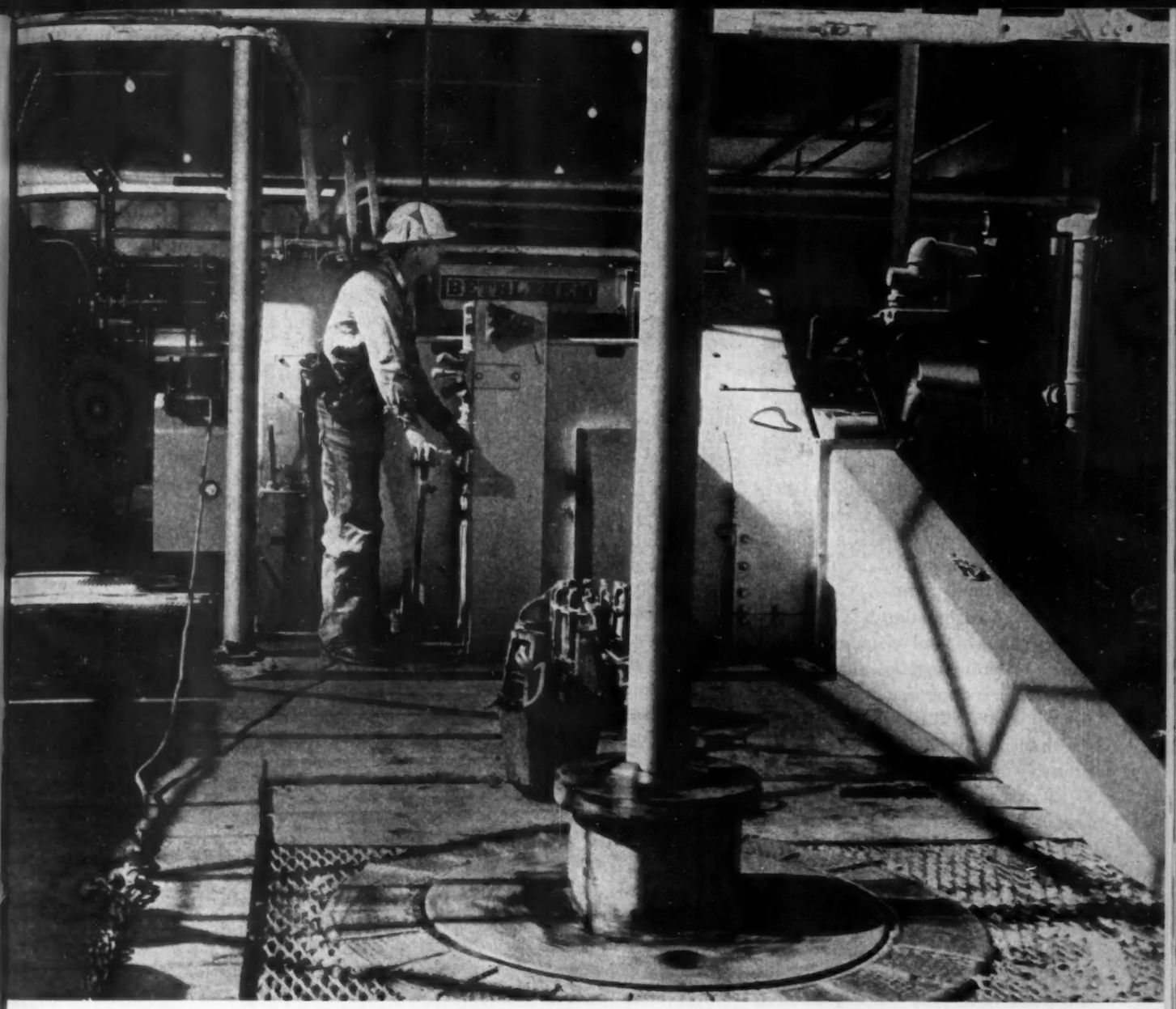
That same engine, mounted crosswise on a slim hole rig trailer, could be too long to come within the highway width limitations, almost surely so if a very extensive compounding arrangement were attached to it. Some slim hole, trailer mounted, rigs have mounted the engine radiators to one side to reduce the engine length sufficiently to permit highway transportation without dismantling.

The subject of engine radiators is a very good introduction to the over-all examination of rotary drilling equipment. It is such an obvious, familiar, and customary attachment to a drilling engine that the need for its presence on one end of an engine seldom is questioned.

The day of unquestioned acceptance of the familiar is over if drilling costs are to be reduced sufficiently to permit exploitation of marginal petroleum prospects. Unless these marginal prospects can be explored, the occasional hit necessary to replace produced oil will not be possible.

It seems almost too elemental to say that a radiator is intended to dissipate heat. But if a serious question is raised as to whether or not a radiator on one end of a drilling engine is the best means for dissipating the heat generated by that engine, then the line of thought begins to assume relevance.

The subject of radiators and heat dissipation from the equipment com-



Making Hole Fast in West Texas

This husky Bethlehem drawworks was photographed making a lot of hole in West Texas. It's an M-810 for medium-deep drilling, and here it was keeping things very much on the go. You will always find this typical of the M-810, a rugged unit with exceptionally high clutch capacity (low-speed drum clutch, 102,000 ft-lb torque at 100 psi!). The rig can be furnished with mechanical drive, fluid coupling, or torque-converter; sectionalized engine compound is standard.

For depths in the medium range, Bethlehem offers a similar but smaller drawworks, the M-58. It too has very high clutch capacity: low-speed drum clutch, 59,000 ft-lb torque at 100 psi. In its size class there is no sturdier unit built. Compound is of sectionalized type so that the rig can be broken down into loads of required road widths. Drives: mechanical, fluid-coupling, or torque-converter.

Both the M-810 and the M-58 are standouts in their respective drilling ranges. For full particulars and operating data, we suggest you call our nearest office.

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prising a rotary rig inevitably raises the question of what heat is to be dissipated, how is it now accomplished, and could the present method be improved upon.

A quick mental survey of a conventional rig reveals that every item of equipment which requires heat dissipation has its own device for so doing and that each of these is of sufficient capacity to handle peak demands even though those peak demands may occur infrequently and seldom, if ever, coincidentally with peak demands of other items of equipment.

Heat generated by the drawworks brakes, which now is carried away by water, may not develop oftener than once every 24 hours, and surely not at the same time that there is a need to cool the lubricating oil in the gear case of the mud pump.

The obvious question is: What are the mechanical and economic possibilities of providing one central heat transfer, or cooling, facility for an entire rig which will be adequate for all simultaneous peak demands but very probably of less capacity than the sum of all present facilities intended to handle each individual peak.

Principal sources of heat from a rig, which represent energy to be wasted, are drawworks brakes or hydromatic brake, the engines, the torque converter fluid if the rig is so equipped, and the lubricating oil in the pump gear end. This latter item has been avoidable in the past but has jumped into sudden prominence with the advent of the high pressures incident to slim hole drilling. Design of some pumps has reached a stalemate because of a lack of cooling facilities for the lubricating oil.

Consolidation of all heat transfer units into a single facility would reduce dimensions of present equipment to the point where highway loading problems would be reduced. Better cooling could be provided and it is possible that an over-all cost reduction could be made. The single packaged unit could be skid or trailer-mounted and placed at a convenient location. The present requirement of heading drilling engines into the summer wind would be removed. Other industries find it economical to cool fluids remote from the heat source, and there does not seem to be any valid reason to ignore that experience.

Uses for that heat, which is energy to be wasted, might be found if it were concentrated in one facility and of a reasonably constant supply; one such use would be the heating of the rig in winter. Primarily, however, an investigation of the subject should be concerned with a reduction in size, hence cost, of the total heat transfer facilities.

The reduction in dimensions and weight of the individual rig components should be designed so that greater portability is assured. Increased transfer efficiency should result from a well designed unit.

The brake linings on the drawworks brake bands serve as excellent insulators to hold heat in the drum flanges. This makes water-cooling of the flanges necessary to carry away generated heat. If the brake linings were placed on the drum, the same insulating medium would serve to exclude heat from the drum flange and might be effective enough to eliminate the need for drum water cooling. Heat would still be generated and still have to be disposed of, probably by water cooling, but the internal piping now required inside the drum probably could be replaced by external piping on the brake bands.

Some drawworks have friction clutches operating inside the drawworks drum flanges. These are seriously affected by heat generated by the brakes. If the heat were excluded from instead of being held in the drum, the clutches would stay in better adjustment during a trip in the hole with drill pipe.

Another lucrative field of investigation is that of power transmission facilities. There appears to be little justification for compound and drives to operate at engine speeds and for speed reducers at each of the driven members.

The pinion shaft on the mud pump turns upward of 275 revolutions per minute to provide a pump speed of 50 to 60 rpm. The V-belt pulley on the pump acts as a flywheel to force the pump to maintain a constant speed in the face of four pressure surges each pump revolution.

These pump surges are significant. They have been measured in actual operations in a number of instances.

A typical 7¾-inch by 16-inch pump equipped with 6¾ inch liners turning 48 rpm and discharging a calculated 418 gpm, showed a stand pipe pressure of 500 pounds per square inch. There appeared to be little variation in that pressure. Yet a strain gage and recorder revealed that there were four pressure peaks each pump revolution. Also the actual pressure varied during each pump revolution between 455 psi and 780 psi, a surge of 325 psi.

The V-belt flywheel prevents the pump from slowing down momentarily to avoid creation of these surges. Therefore, the gear end of the pump is subjected to a repeated momentary overload, four times a revolution, which may mean from 200 to 250 times a minute. It is primarily this condition which necessitates the high safety factors built into power pumps. If it could be avoided, pump weight and cost could be reduced and service life extended.

These damaging pressure peaks can be minimized by removing the V-belt flywheel, which means chain drive. A good desurger on the pump discharge also will help.

During this same investigation two types of desurgers were tested. One type consisted of three horizontal cylinders stacked one above the other. The other type was a vertical cylinder in which a hydrogen-inflated rubber bag was suspended from the top.

The horizontal desurger consisted of a perforated nipple around which was clamped a rubber sleeve. The annulus between the rubber sleeve and the containing steel case was charged with nitrogen to 250 psi. Mud entered the perforated nipple and, at high pressure, flowed out through the perforations stretching the rubber sleeve and compressing the nitrogen gas in the over-all containing steel case. The other type of desurger allowed the mud pressure to compress the nitrogen gas-filled rubber bag.

The three compartment horizontal desurgers reduce the surge per pump revolution from 325 psi to 140 psi. Three of the vertical type reduced the surge from 325 psi to 85 psi and a

fourth brought the surge down only an additional 5 psi. When the horizontal type and all four vertical desurgers were used simultaneously the surge was reduced to 70 psi.

Chain speed is high when it is driving a pinion shaft at 275 rpm and wear is rapid. There seems little justification for subjecting a chain drive to such wear-producing speeds to drive a speed-reducing device in the pump. That is all the pinion-bull gear combination is. The speed reduction could be obtained at the engine output shaft ahead of the pump drive.

Such a drive would eliminate the need for a bull gear in the pump. The implications of that elimination in terms of weight and cost reductions are significant. It would greatly simplify the design of a horizontal, four-cylinder, opposed piston, plunger pump; a pump needed for the high pressure low volume service in slim hole drilling. The present three-cylinder plunger pumps have too long crank shafts. The opposed piston pump would need but two throws on a short horizontal shaft, and, without a speed reducer in it, it would be of relatively light weight.

The horsepower transmitting ability of either chains or V-belts is reduced as the lineal speed is reduced. Therefore, heavier chains would be required at the slower speeds. This would not be too significant since the heavier chains at the slower speeds would not be subjected to the failure inciting high speed reversal of directions.

A chain drive would transfer the recurring peaks from the pump to the drive and back to the engine. A convenient means for absorbing these surges and excluding them from the engine is a torque converter. Unless the surges are prevented from entering the engine, these failure-producing elements, although removed from the pump, will be induced into the engine with consequent increased engine maintenance costs.

Serious consideration could be given to the inertia of the various elements now requiring acceleration and deceleration in a conventional compound drive, transmission, and drawworks during hoisting operations.

It is well known that power requirements for hoisting empty blocks on a trip in the hole with drill pipe are high. Drawworks drum shafts have been kinked during that one operation because the hook, blocks and elevators must be accelerated rapidly thereby necessitating application of all horsepower available from the engines. The initial application of that power is made at a time of low engine speed, when power output is below maximum. Hence, the engines must bring themselves up to speed during the time of maximum power demand from them.

Torque convertors allow the engines to turn up top speed thereby developing full power while at the same time providing some cushion to the driven load. This reduces the severe accelerating forces until the load is moving. Very probably dimensions of some parts of the hoisting apparatus could be reduced and lightened if the drawworks designer could be assured that the terrific strains incident to rapid acceleration and deceleration could be eliminated.

Every change in speed or direction of the drawworks involves stopping and starting the complete system of chains and shafts. The accumulated inertia of all the component parts is significant. Power is required to start these parts in motion. Heat is generated when they are stopped by a brake. It would be well to reduce their combined mass to a practical minimum.

The oil industry seems to be the only one which places an operator with his back to his work. Most of the driller's controls are on the drawworks so he cannot watch his controls and indicators and his work simultaneously. The operator of a mine hoist, power shovel or almost any other piece of equipment faces his work across or through his controls. Usually, also, he is seated comfortably while at work so that he is able to devote full attention to the work. Some consoles are available which do permit the driller to partially face the rotary table. Most of these have rotated the point of control only 90 degrees instead of the desirable 180 degrees.

Some drawworks have been placed at ground level under the derrick floor with remote controls operated from the derrick floor. The only mechanical problem connected with that practice concerns the brake. All other controls are sufficiently flexible to permit their installation at any convenient location.

Brake handles have traditionally extended out in front of drawworks, but they could just as easily be on top. If that were done, the drawworks and engines could be placed on the ground and the driller's position would be on the drawworks flat top, level with the derrick floor.

Elimination of the expensive and elaborate steel substructure now hauled from location to location merely to hold the drawworks and engines up in the air might reduce costs significantly. It does not seem advisable to continue to allow the traditional position of the brake handle to interfere with a needed revision in equipment design and use. A flat top drawworks would provide additional derrick floor working space. Now the drawworks uses up derrick floor space.

The derrick floor needs to support only the rotary table and provide working space. It does not seem necessary to support the drill pipe several feet in the air while it is out of the hole. The rotary table must be elevated to clear the cellar controls below it, but the stands of drill pipe could just as well rest on the ground or sub base when they are racked in the derrick. The derrick man could be moved down a few feet so that he would be positioned properly to handle the elevators as the stands were picked up from or set down on the sub base instead of the elevated derrick floor.

The sub-structure provided to hold the drill pipe up in the air during a trip is no more needed than is the support for the engines and drawworks. The rotary table is the only item of equipment needing elevation and a small movable platform would suffice for that. The flat topped drawworks would be pinned to the platform to provide additional stability to the platform and increase working floor space.

Substructures and supports are originally expensive; cost of moving them from location to location is high. They should be almost indispensable if this continuing cost is to be justified. There is a reasonable doubt that such indispensability does exist.

Present increased use of tool joint equipped tubing for drill pipe at first glance seems to be directly opposed to the historical evolution of drill pipe

from tubing. The upset ends of drill pipe were developed to increase the straight tube's resistance to joint failure when it was used as drill pipe. Originally, all drill pipe upset was taken on the inside. With increasing well depth, the constricted tool joint bore prevented adequate fluid circulation, and a change from the regular to full hole joint was made. This increased the fluid circulation capacity of the drill pipe.

Some time later additional depth brought about the internal flush joint. Here all of the upsetting is external. The restrictions to fluid flow is reduced to a minimum. Regardless of joint, the pipe itself has been thick-walled to stand abrasion and resist fatigue.

It would appear that all of the evolutionary progress in drill pipe development has been cast aside and that the industry is now back at the beginning. A significant change has been made, however, in the way in which drill pipe is used.

Drill pipe used to be run in compression. Now, practically all strings are run in tension with drill collars supplying the bit weight. This means that no longer is the lower section of drill pipe subjected to the fatigue-producing stress reversals that formerly were present. It is not necessary today to use a string of drill pipe that will stand up under the severe service conditions which necessitated the development of thick walled and heavily upset drill pipe.

The decline in use of fish tail bits reduced the torque transmitting requirements. Tubing serves very well to raise and lower drill collars and to provide a conduit through which mud can be pumped to the bit.

Significant reductions in hoisting and pumping equipment have been made possible through the substitution of tubing for drill pipe in medium depth drilling. These lighter hoisting and pumping devices are originally cheaper, less expensive to move, and require smaller engines which contribute to lower initial and operating costs. Used tubing has considerably more utilitarian value than used drill pipe in spite of its lower tonnage.

The current increased use of 4½-inch OD casing has reduced the need for the larger drilled holes. Most Western Kansas holes today are cased with 7⅞-inch through 8⅝-inch OD surface casing. This is not because a 7⅞-inch hole is needed to receive 4½-inch OD casing, but is rather to facilitate the fishing of 4½-inch OD drill pipe universally used in Western Kansas drilling. A 6¼-inch hole drilled with tool joint equipped 3½-inch OD N-80 EUE tubing would serve equally well for a production string of 4½-inch OD casing.

A light rig with two 150-horsepower engines behind the drawworks, one driving a 12-inch pump capable of delivering 200 gallons per minute against 800 psi discharge pressure, and the other driving the rotary table, would make an excellent 5000 foot Kansas rig. The two engines should be provided with a quick compounding device so that the entire 300-hp would be available to the drawworks for a trip. They would again be split when drilling was resumed.

Such a rig would have several advantages: (1) Drill pipe would be hoisted at 100 feet per minute off bottom; (2) excessive horsepower would not be available to the rotary table driving the tubing drill pipe; (3) sufficient fluid would be circulated to maintain an annular mud return velocity of at least 175 feet per minute; (4) both engines would be operating at the proper temperature when the drawworks load was thrown on them to make a connection; and (5) the two-engine set up would provide a safety factor against single engine failure.

Tubing is not acceptable drill pipe for drilling much below 6000 feet or when long strings of drill collars are run. Unless special racking provisions in the derrick are provided, tubing must be racked in doubles which limits the amount of pipe that can be handled on a trip.

Tong and spinning lines traditionally have been operated from the drawworks cat heads. Chain or cable failures place the cat head operator in a very hazardous position. When tubing is used as drill pipe a serious threat to kinking develops if the slips are set too high when tool joints are made up or broken out.

At least one manufacturer has developed hydraulic pistons for this service and has placed one on each side of the mast to the left and right of the driller. Each pulls against the other so there is no tendency to bend the joint of pipe in the rotary table. Very closely controlled and uniform joint make up is assured by setting the relief valve on the oil pressure system to a predetermined pressure so that each joint is made up properly. Proper joint make up does reduce joint failure.

Great strides have been made in the use of alloy steels in rotary drilling equipment. These stronger steels have made possible the fabrication of rigs adequate for the extreme depth drilling currently underway. Still there is some doubt that there has been sufficient use of alloys in the 5000-foot rig class to reduce the weight of that size rig.

Weight is important; a difference in moving costs of $1500 is equivalent to a difference of $0.30 per foot on a 4500-foot well, and at the same footage, price could represent the difference between profit and loss.

The most economical hole any rig can drill is the largest hole possible to the projected total depth. Attempts to reduce drilling costs by reducing drilled hole size with the same rig nearly always have resulted in increased, rather than reduced, costs. Reduced drilling costs of the smaller holes result from the use of smaller, hence lighter and cheaper, equipment. Conventional shallow, big hole rigs cannot realize any cost reduction by decreasing hole size.

An entirely new assembly of equipment is necessary to insure financial gain through the drilling of the hole sizes adequate to receive the modern small diameter production casing strings. In view of the abundance of conventional rigs available, most drilling contractors are understandably reluctant to invest between $125,000 and $200,000 in a new lightweight rig, particularly so when the smaller hole technique has not yet proved itself in all areas. Unfortunately, it cannot be proved until it is tried. In the meantime, attempts to reduce drilling costs further are about stalemated because the equipment in use costs so much as it does to buy, move and operate.

Modern, lightweight equipment appears very well suited for Western Kansas drilling; conditions are similar throughout much of the area. Competition between contractors is keen and much of the equipment currently in use is identical. It is possible that a fresh approach to the problem of equipment design would provide a means by which a fair return to the contractor, at existing prices, would be provided. —**The End**

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DRILLING PROGRESS

Will the Banks Finance the Contractor?

Yes, says the author, if they meet the same requirements as any other borrower.

By HAROLD VANCE, Vice President
Bank of the Southwest
Houston

AN INDUSTRY which does a gross business of $1 billion annually should have well-established credit relationships. However, such relationships do not exist for drilling contractors, even though they drill 92 percent of the nation's wells. Why?

At first glance, it would appear that drilling contractors are confronted with no more serious problems than persons engaged in other enterprises. For example, if a man has the ability to drill wells and has contracts from reliable persons for wells to be drilled but has no drilling equipment or money with which to purchase it, he must take someone in with him who has the money or credit. He must share his venture with others who expect to profit by the venture.

However, banks, which are equipped to take care of all the financial needs of the drilling contractor, apparently are failing to handle loans for purchase of equipment. There are other lending agencies such as investment bankers, large credit concerns and, finally, the contractors who could set up their own credit union. In a credit union the contractors would be passing on the credit responsibility of its own members.

It has been the practice for the supply company to sell the drilling rig and supplies to the drilling contractor and to charge the contractor interest on the unpaid balance. The supply company credit men use about the same kind of thinking as bank loan officers in deciding to whom a rig will be sold on time and how the balance due will be paid. General practice is to acquire a down payment of one-third and the balance payable over 36 months.

Banks do not want to take over the notes and mortgages from the suppliers. It has been suggested that the bank take these loans over with an agreement that the supplier is to repurchase the debt when requested by the bank. Such an arrangement places the entire responsibility for payment on the supplier and the bank needs only consider its financial responsibility.

Suppliers' experience with rig loans has resulted in losses no greater than bank loans generally. There are probably several reasons for these favorable results: First, the supplier's credit men are experts in their line, while bank loans on rigs have been made by

HOW 32 DRILLING CONTRACTORS GET LOANS

SECURITY	PERCENTAGE OF TOTAL DOLLARS LOANED
Accounts receivable	24.5
*Mortgages on equipment including drill pipe	35.0
Mortgages on oil and gas production	32.0
Guarantee on endorsement of others	1.0
Assignment of contracts	1.4
Open note	5.5
Other collateral	.6
TOTAL	100.0

*** In only one case is the drilling rig total security of the loan and the amount of this loan is 1 percent of the total loans to contractors.**

This loan record—representing 32 drilling contractors—is believed to be typical of banks which have credit relationships with drilling contractors.

general loan officers; and second, the supplier has a market for any rigs which must be taken over by foreclosure.

Similar good results could be expected by banks if they could duplicate the two conditions mentioned above. A bank having an oil and gas department is ideally suited to handle the financial needs of the contractor. With such a department providing credit experts on the drilling contracting business it could bring together, for their mutual advantage, contractors and operators doing business with the bank.

Bankers have considered rig loans to contractors hazardous because of losses taken in such loans, fluctuation in drilling activity, and because they believe failures to complete a well in accordance with the contract are high.

In the oil well drilling contracting business, men and machinery are used to produce income by making a hole in the ground which is paid for at a contract price per foot plus such additional work as is necessary which is paid on a contract day basis. The opportunity to use the equipment is governed by a well by well agreement. If a reserve of contracts and the rate of awarding such contracts at a price which would produce a reasonable net income were available, rig loans would have more stability than loans on gasoline plants. Recently, up to 20 well contracts have been given to one contractor.

In the past year a number of offshore drilling rigs have been financed through banks and through the sale of stock to the public. This has been made possible because operators have been able to guarantee the use of these rigs, at day rates, for a period of time that would insure partial or complete payment of the loan.

Contractor-Operator Relationship—In 1926 the old Marland Company had several drilling rigs in the McCamey, Texas, area which were running purely for the purpose of determining the cost of drilling in that area. These rigs were operated, as nearly as possible, like the drilling contractor operated and wells were drilled much faster with company tools. With this drilling time as a measure of cost, some were of the opinion that the company would soon be doing all of its own drilling. However, when the bookkeepers got through adding all the overhead and indirect supervision, it was costing the company a third more to drill its own wells than by using the drilling contractors. Many operators followed a similar practice and the contractor was paid a price to yield a fair return. It is believed that some concerns still follow a similar practice.

The oil producer has found it cheaper to contract for the drilling of wells than to drill them himself. Due to the fact that contracts are awarded on the basis of the lowest bidder, the oil operator, in some instances, has actually forced the drilling contractor into drilling deals, thus acquiring production sooner or later. This puts the contractor into competition with the producer in order to exist.

Another financial difficulty which confronts the contractor is the failure of the person who employs him to promptly make payment for the contract after the well has been completed. Sometimes it may take three or four months after the invoices are due before payment is made and some say this delay in payment is not confined to folks whose ability to pay might be questioned. A number of contractors have found it necessary to borrow money on these accounts receivable and banks have readily made such loans. In other words, the drilling contractor is required to pay interest on money due him.

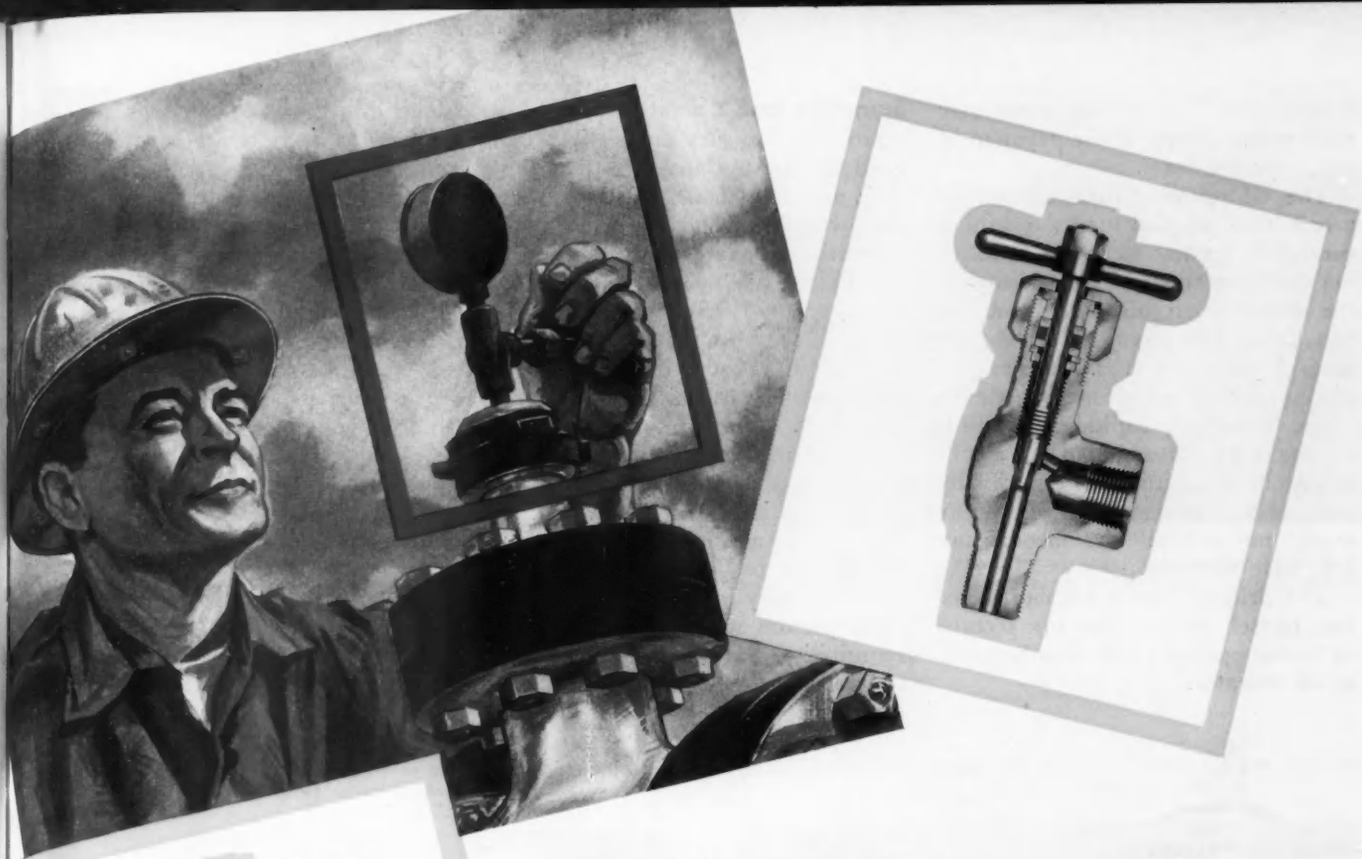
The contractors are not only bidding against each other to the extent that they have had to seek other sources of income, namely, that of finding oil of their own, but they are confronted with the problem of securing prompt payment for the work they have done. Both of these practices lend to financial instability of the contractor and it looks as though only these contractors who are well financed and have some other source of income will, in the final analysis, continue to be able to serve the industry.

The only reason that a contractor would receive a contract from anyone needing a well drilled is because they are satisfied he is financially able to complete the well. If the contractor questioned the ability of the operator to make payment for the contract price of the well he would ask the operator to escrow the amount of money which would be due upon the successful completion of the contract. The practice of making payment at one time for the entire amount due under the contract still generally prevails, although there are a number of instances where token payments have been made during the progress of drilling. If the contractor is financially responsible in the first instance, even though he lost the hole, he would be in a position to go ahead and complete a second well, and, if not, he would be in a position to reimburse the operator who hired him in the first instance.

Enlarging contractors operations—The drilling contractor might improve his position by doing more turnkey drilling work. He could deliver to the operator a completed well into the tanks, and even operate the well after its completion. As drilling contracting is generally being conducted at this time, the operator is, in effect, letting a number of contracts all having to do with the completion of the well. For example—he lets a drilling contract which has to do with furnishing the rig and machinery and labor to make the hole and to do such other work on a day basis as is necessary to complete the well.

In connection with this work, several service companies perform work on the well as independent contractors. The services of an outside consulting engineer are often used to complete the well, and finally the well is turned over to an owner who is probably not conversant with well operations in the first place. In other words, the drilling contractor might place himself in the same position as a general contractor on a construction job. He alone is responsible for the overall job and delivers the work according to specifications to the operator.

Income Tax—From profit and loss statements it can be shown that the government takes more of the profits of business than the one who does the work. If corporate earnings are distributed as dividends, then the owner of the business—the one who does all the work and takes all the risks—receives about 25 percent of the fruits of his labor. No wonder the drilling contractor is tax conscious. In an effort to protect himself, the contractor is seeking to continue some depreciation allowance but to maintain a depreciation allowance he must continue to acquire non-depreciated equipment; thus, he could finally find himself with no profit and a lot of



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drilling rigs. The drilling contractor must resign himself to the payment of yearly income taxes.

The oil operator finds himself in a better tax position than the drilling contractor because he has a continuing depletion allowance in addition to the depreciation allowance and he can delay the payment of income taxes by drilling wells. In the final picture, the oil operator may sell his property and pay capital gains tax if he has been fortunate and has not acquired bad business practices by continually taking deals which he would not take if the income tax laws were different.

The drilling contractor can never find himself in the same tax picture as the oil operator unless he becomes an oil operator.

Summary and Conclusions—The petroleum industry and the public need the drilling contractors because they are able to drill wells cheaper than can be drilled with company tools; thus, making petroleum and its products available to the public at cheaper prices than would otherwise be possible. Competition within the industry can and will eliminate the incompetents just like it does in other industries.

Individuals starting in the contracting business should be fully aware of the difficulties to be encountered in the industry as a business venture and should be properly financed. This financing may include taking in with them persons who have financial responsibility. Banks are ideally suited to handle the entire financial needs of the drilling contracting industry and should provide themselves with a qualified type of credit man to properly evaluate the credit responsibilities of the various contractors.

Banks with oil and gas departments, if properly provided with drilling rig credit men, could perform a valuable service to both the operator and the contractor by bringing these folks together. Contractors as well as other business people who think only in terms of the income tax law in conducting their businesses will soon lose or fail to acquire good business judgment.

ACKNOWLEDGMENT

This article is an excerpt from the paper: "Financing the Oil Well Drilling Contractor," presented by the author at the 15th annual meeting of the American Association of Oilwell Drilling Contractors at Houston, Texas.

Can Engineers Help the Contractor?

Drilling practices, maintenance programs, and assistance on complex bids are handled by one company's engineering department.

THE ASSUMPTION that the low bid is the best bid may be depriving many operators of the most for their money. Certainly any contractor can drill the required hole, but is it the cheapest hole? Poor operations by rig personnel oftentimes can result in excessive mud costs or hole troubles in producing. Yes, the payment to the contractor is less, yet the cost for the well is greater.

Contractors have demonstrated beyond question that they are the most economical means by which companies can drill their wells. This does not imply that all contractors are equal in their ability to do the job satisfactorily. An examination of various contractors will reveal a new kind of drilling business.

Modern contractors base their operations on engineering principles through specially trained engineers. This may come as a surprise to some who still think of the drilling industry of 10 to 15 years ago. Many operators when letting a contract are not aware of the added time, care and expense which some contractors have provided to insure the operator the most for his money.

Among the first drilling companies to recognize the need for technical aid in drilling wells was Great Western Drilling Company of Midland, Texas. Engineering is evident in all phases of this company's operations. The intricate task of uniting years of practical experience with engineering technology has been accomplished as is illustrated in the following account of this company's operations.

Activities of the engineering department are directed by the chief drilling engineer who also is a member of the drilling department management staff. In this position he is able to bring engineers into company operations as a functional group instead of an advisory group.

Engineering responsibilities touch every phase of the drilling operation from assisting in computation of complex bids, to selecting liner sizes and bit types. There is little time for keeping records or other routine paper work. This is done by clerks. Equipment selection, rig-up design, investigation of equipment failures, testing of various equipment, supervising drilling programs and many other problems require a diversified engineer.

It has been found difficult to realize the full benefit from engineers if they work under non-technical men. Great Western solved this by having engineers report only to the chief engineer.

Except in emergencies, engineers do not alter instructions given by any department head or supervisor without first consulting with the respective supervisors. As would be expected, a great deal of resistance had to be overcome before the engineers' position could be established. With the growth of confidence, working together has become such a habit that misunderstandings have all but been eliminated. Progressive thinking leaves little room for anything except teamwork.

Engineers are now taken for granted. Many phases of the tool-

FIGURE 1—W. A. Sitko, equipment and testing engineer testing drilling engine with H. C. Jones, maintenance superintendent.

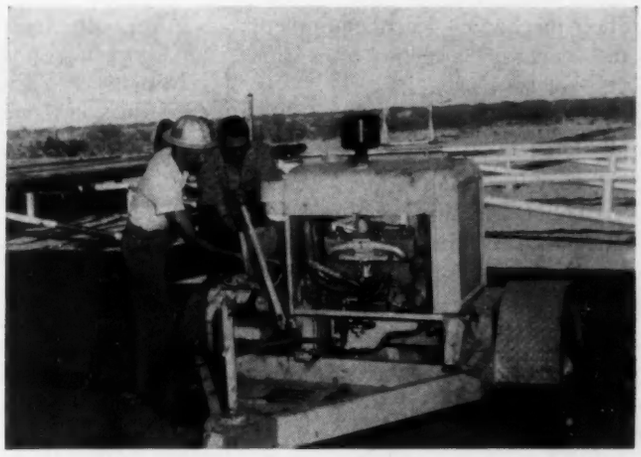


FIGURE 2—Checking a new type of power tong equipment is R. E. James (left), division drilling engineer and manufacturer's representative.

Drilling Engineers have many and varied duties

FIGURE 3—H. E. Mallory, mud engineer makes mud tests with mud company service engineer.

FIGURE 4—Division engineer M. T. Parker checks blowout preventer with inventory department clerk, D. L. Foster.

pushers and superintendents' jobs have been made easier. Studies of drill pipe and drill collars have resulted in fewer fishing jobs. Complete programs for drilling the wells including proper sizing of pump liners and bit nozzles, rotary speeds, bit weights and mud recommendations based on careful study of all available information make it possible for the toolpusher to do a better job.

Failure of a bit to perform as expected, hole deviation or any other adverse conditions oftentimes results in a call to the drilling engineer for an explanation and assistance.

Through proper application of equipment it has been possible to reduce downtime and maintenance costs. Rigs designed for a specific job are limited to that job. When engines are reported as overloaded the engineer checks horsepower delivery and traces the trouble. Since the well program was designed before rigging up, it is rare indeed that the load must be reduced. Most overload or heating cases result from low BTU fuel, fan blading, improper timing, clogged regulators, etc. It is quite simple to determine when some malfunction of equipment is causing trouble, thus saving time and money by not sacrificing performance of pumps or drawworks to match poor performance of engines.

In addition to the above advantages of an engineering department, it is evident that better informed personnel will be available for the operators. A great deal of time is spent in development work as well as training of personnel in new and proper methods. Extensive training is available to pushers and drillers in the care and handling of muds (resulting in better care of operator's investment), drilling practices and care and handling of equipment.

Engineers also assist in coordinating training schools for rig personnel to improve care and handling of equipment at the crew level.

How An Engineer Is Trained. Only graduate engineers are selected for the rigorous 18-month training program.

The first six months is divided into several phases including:

1. Production roustabout—familiarize trainee with general problems of production.

2. Shop mechanic—learns equipment; must answer questions on various equipment.
3. Field mechanic—further familiarization with rig and equipment.
4. Inventory department—learns methods of handling equipment for inventory and dispatching same to rigs.
5. Engineering department—introduction to engineer's responsibilities.

After six months the trainee is assigned to a rig and is worked in all positions during the next six to eight months. Then he is made a driller for the remaining time on the rig. During the entire training program every man for whom the trainee works fills out a personnel rating sheet grading him on personality, character and aptitude.

After completion of the program he is made a junior engineer. Eighteen months of diversified field experience does not make an engineer. He must be trained still further under the guidance of division engineers and in organized specialty schools. Degree of responsibility and type work he is permitted to do will depend upon the individual.

The job of acting as advisor and partner to highly specialized field men requires more than technical skill. A real sense of human relations is essential to a successful drilling engineer since, although he is acepted by his co-workers, he still is expected to find weaknesses in present methods and recommend changes. This is no easy task when the longevity of many practices is considered.

After three years, an engineer should have the qualifications to assume the duties of a drilling engineer. Many engineers have become discouraged after starting to work with various drilling companies. The work is hard, the fringe benefits are few when compared to offers by other segments of the industry. Misunderstandings are to present status or future with contractors also has detered many from entering the drilling field.

Contractors in general realize the need for technical aid but few have accomplished the task of acquiring and integrating this aid with their organization.

Engineering is finding its way into the drilling contractor's organization. In the meantime, are you getting the most for your dollar when you select your contractor? —**The End**

The Operator Can Help the Contractor

Here are the main omissions or commissions that the contractor would like considered and remedied.

By MORRIS McDANNALD
Mac Drilling Company
Houston

IT HAS OFTEN been said that there are two things of which we can be certain—death and taxes. A third can be added—*constant change*. This is particularly true in the contract drilling business and the oil industry. A drilling contractor wakes up in a new world every morning. Something new happens every day. A short time ago a company crew was making hole, really "getting after it." They did get the hole, but on one connection they forgot to shut the pump off and broke the kelly with the pump running. They woke up in a new world, but quick, a world of mud. Also recently a rotary master bushing was lodged in the conductor hole. No doubt this has happened before, but it was a first for this company. It was down only about 20 feet below ground level. But it still was a fair fishing job. Luckily, it was fished out without too much delay.

Everywhere change is taking place, and to stay on top in the business world we have to be ready to meet that change. In the drilling business as in all businesses if we fail to meet the changing conditions, we are headed toward the most certain thing of all—death.

The most radical change that has taken place in the contract drilling business is diminishing profits. The drilling contractor now faces the shock of fighting to survive, whereas, just a few short years ago his profits were sufficient. The operators have heard quite a bit about this now but it is every contractors duty to keep on this theme until some relief is obtained. If the contractor doesn't plug for himself, who will?

Of course there are two ways a contractor can improve his profit situation. One is by getting more money for his services; the other is by improving his efficiency, thus, cutting his costs. Some of both would help. As to improving his efficiency, the record speaks for itself. What other service or industry can you name that gets the same unit price for its efforts as it did previous to World War II. Of course the day work price had to go up and did, but the footage price is still essentially the same. There is nothing wrong with the drilling business on the Gulf Coast that an increase of a $1 per foot wouldn't cure. Of course, we want to continue to strive toward greater efficiency and therein lies the main point of "How the Operator Can Aid the Contractor."

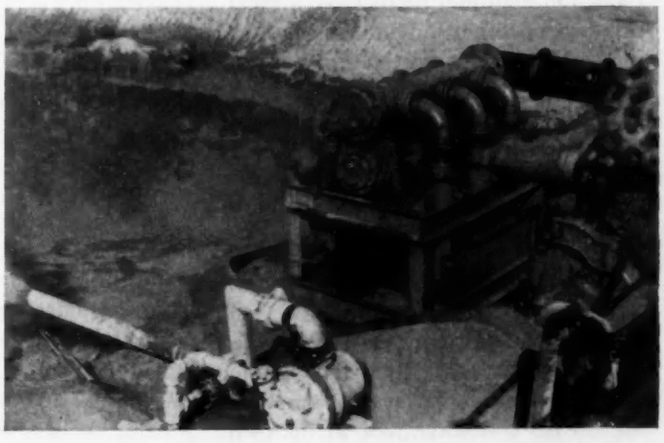
Repeat Work in Same Field or Area. A change, in recent years, that has affected the drilling contractor tremendously is the smaller area extent of new fields. The large and sprawling fields like Oklahoma City, East Texas, West Ranch, Hastings, etc., obviously were found first and now as the pickings get leaner the contractor finds himself constantly on the move. This affects him in a great number of ways. His trucking becomes a more important item. His crews become stable if he remains in the same

Why this pile of sand means lower drilling costs for a South Louisiana operator

The sand in this picture is part of nearly 1500 barrels that a Dorrco D-Sander removed from the mud in drilling one well in South Louisiana. Notice the sharpness of the cliff-like edges which show that the D-Sander not only removes coarse sand but also a great deal of silt and drilled clay solids.

As a result of this, pump parts last longer, bits drill faster and last longer, drilling time is reduced and the cost of mud chemicals is lower.

In one series of controlled comparisons a Dorrco D-Sander saved an average of more than 5,000 dollars per well. Because of savings like this, more and more contractors are installing Dorrco D-Sanders as standard equipment on all their rigs.



Write for Full Information.

SWACO

SALT WATER CONTROL Inc.

A Sid Richardson Development Company

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area and they improve on drilling practices thus cutting time on each succeeding job. If the area is suitable for skidding, great savings can be realized. It is obvious that a contractor already in a given field or area should be able to do the work at less cost than another contractor, everything else being equal. Therefore this contractor should be favored over others for further work in the immediate field or area. Any substantial savings should be shared with the operator. It would really help a lot if straight bidding on additional wells in the same field or area were eliminated and a negotiated contract made. There are too many instances of contractor rigs meeting on the road going in opposite directions, each moving very near where the other one left.

Jet Bits, Drill Collars and Oil Emulsion Mud. Jet bits, more and larger drill collars and oil emulsion muds are the main reasons for the great increase in penetration rates in recent years (drilling time almost cut in half since World War II). Some operators still will not permit the use of oil emulsion mud. This is understandable in certain cases where the oil in the mud may confuse the evaluation of a wildcat. But, why restrict its use in proven areas? No operator would tell a contractor he couldn't use jet bits or a certain number of drill collars. Why shouldn't oil emulsion mud be just as standard as the other time saving tools. Oil emulsion muds have a great number of other advantages besides increasing penetration rates. For instance, they help prevent stuck drill pipe and stuck casing; they decrease drill pipe, tool joint and drill collar wear, and also lubricate the bearings in rock bits giving them more rotating life and total footage. Here is truly a money saving practice in the drilling of a well.

Running of Casing and Waiting on Cement. It has been the custom for years that the contractor run casing on his own time and at his own risk. Of course on shallow strings of big casing the time and the risk are low. The time could easily be figured in the bid and the operator would pay for it. But how about the risk? Well drilling is constantly changing. With the long and heavy strings of 13⅜-inch, 9⅝-inch and 7-inch now being set, the risks are becoming staggering. With both operator and contractor representatives on the job, why should the contractor bear this risk alone, except in cases of gross negligence? Add to this the hazards of many centralizers and scratchers that the company puts on and it appears that the risk without a doubt should be theirs. Many companies today openly say the risk of getting these long strings of big pipe to bottom is their's. They benefit, when taking this position, by receiving a lower price for the job. The same applies to waiting on cement after oil string. Several companies now begin day work the instant the plug hits bottom on the oil string. By doing this they get a lower footage price because the contractor can deduct 72 hours waiting time from his total cost and therefore bid lower per foot. If the three days waiting on cement is assumed by the contractor he has come out a little ahead if the well is dry and no oil string set. Some operators get around this by asking for credit of a certain number of hours if no oil string is set. This procedure could be eliminated if the bid was based on the day work starting when the plug hits botton on the oil string.

Blowout Prevents Hook-Ups and Choke Manifolds. In the Gulf Coast, blowout preventers and choke manifold hook-ups are of utmost importance. Every contractor and operator wants this equipment in working order and tested before drilling the plug. In addition they should be tested at regular intervals during the drilling of the well. Further precaution should be taken in informing the crew on what each crew member is to do in case of a blowout. Most important of all definite measures should be practiced as routine by the crews to prevent blowouts; such as specific procedure for filling up the hole on trips. Constant check of the mud volume should be made during drilling so that a gain or loss of mud is known immediately. In short, it is everybody's business to prevent blowouts and to control them if they should happen. But why can't blowout preventers, hook-ups and choke manifolds be standardized? A lot of time is wasted on nippling up and a tremendous amount of money is being tied up in extra equipment because practically every operator has a different idea on blowout preventer and choke manifolds hook-ups. Savings effected in the solving of this problem are bound to be shared by the operator.

Bid Sheets. Many operators today send out a bid sheet that becomes a contract if the bidder is successful in getting the job. This is certainly a benefit to both the operator and the contractor. These bid sheets, since they later become the contract, cover every factor involved in the drilling of the well even to the detailed mud program. Each contractor bidding on the well is aware of all the variables. This reduces to a minimum any concern over who is to furnish what. From a contractor who has bid on many wells, and incidently was many times a bridesmaid instead of the bride, this procedure is highly recommended to the operators who merely send out a short letter or asks for bids over the telephone. The time saved by the operator from questioning over the telephone should be substantial.

In recent years, free cores, free time for doing this and free time for doing that are gradually disappearing from bids although some companies still request certain free items of time. It is well that this request is disappearing as everyone knows there is no such thing as free time. It has to be figured in the bid, and, like waiting on cement time mentioned earlier, costs the operator, needlessly, if it is not used.

Standard Drilling Report Form. A Standard Drilling Report Form developed by AAODC and approved by API is available to every drilling contractor and operator. Still it is not accepted by some operators and not used by some contractors although accepted by many of their customers. Here is a means of educating our drilling crews to a standard form and we should take advantage of it. If everyone would use it, think of the efficiency that would come about when the labor pool was thoroughly familiar with it. In addition to time saved by making out only one report, errors would be reduced to a minimum merely because the procedure of figuring footage and other items is standardized throughout the industry. A more thorough record would be available of every well drilled as this report form covers every important factor in the drilling of a well.

The main ways that we can increase our efficiency and cut our costs have been mentioned and the list

could be added to. These changes could save a lot of money that could be shared by both operator and contractor.

The contract drilling business is a well accepted service by the oil companies, otherwise it would not be drilling over 90 percent of the wells. The oil operators recognize the contract as the cheapest way to drill a well and they respect the judgment and opinion of the contractor and want to see him stay healthy.

The drilling contractor-operator relationship is good and always will be because both are the same type personality. They have worked closely for years with mutual problems and will continue to do so. By cooperation and understanding they will meet the changing conditions. —**The End**

An Operator Looks at the Contract

Contracts entered into in good faith should obligate both parties to cooperation and understanding beyond the written word of the contract.

By S. C. OLIPHANT
Vice President
Tennessee Gas Transmission Company
Houston

WHEN BREAD-SLICING machines first began to appear, a small-town bakery decided to conduct a survey and find out what its customers thought of the new machine.

So one of its representatives set out with notebook and pencil. He found one housewife who was very enthusiastic.

"Why, madame," he asked, "do you favor machine-slicing so strongly?"

"Well," she replied, "mainly because we ain't got no knife."

The relationship between oil companies and drilling contractors is not quite that drastic. Oil companies *do* have drilling rigs. But, to a very great extent, they must depend upon contractual drilling.

At first glance, this dependency might be questioned. Why should an oil company contract its drilling operation, passing on a profit to someone else? Wouldn't it be more profitable for a company to have its own rigs, do its own drilling and keep this profit within the corporation?

The answer is no. Experience in the oil industry and other industries as well provides ample evidence.

Cost Is Big Factor. Most manufacturers—makers of radios, automobiles and refrigerators, to name a few—either contract or subcontract for parts, supplies or labor. The reason is obvious. Unable to maintain a full load factor for certain portions of the manufacturing process, these companies can obtain the required material or labor at less expense on a contract basis. Conversely, the contractor is able to establish a full-time work load by manufacturing specific parts or by performing certain work for several established customers. Therefore, the finished product is less expensive.

So it is in the oil industry.

There are in the U. S. approximately 4800 drilling rigs owned by both oil companies and drilling contractors, and it has been estimated that more than 57,000 wells are to be drilled this year.

The average oil company, no matter how well organized and efficient in operation, cannot maintain enough rigs to carry out its drilling program. There is not only the problem of having a rig at the right place at the right time, but there is the problem of having the correct sized rig at the right place at the appropriate time. Such problems are costly and troublesome to the oil company. It is because of these problems that it must rely on the drilling contractor.

Drilling contractors, as a group, are able to provide the size of rig that is needed for a particular job. Because of the large number of rigs available, they usually can provide one when and where it is needed. And the contractor is a specialist, keeping up (or at least he should keep up) with the latest advancements in drilling techniques.

Mutual Obligations. From this oil company-drilling contractor relationship there arise certain important obligations—obligations which both parties must be prepared to meet fully and competently if a successful operation is to be the result.

The first obligation is in the matter of bids and rates. The company must supply the contractor with information sufficient for him to be able to submit a realistic bid. The contractor, in turn, must charge rates which are fair, enough to provide him with a reasonable profit, but no more.

It should be neither the desire nor the intention of the company to force the contractor into bankruptcy by requiring unreasonably low rates. Nor should the contractor bid low purposely in order to get on the company's work list or with the thought of obtaining adjustments later, or of making up the loss on subsequent wells.

Some operators employ contractors on a cost-plus basis in instances where a realistic bid would be difficult, and where the contractor is reliable and known well by the operator. The customary day rates provided in drilling contracts are a form of this cost-plus system.

It is also an obligation of the company to give the contractor adequate notice of the need for a drilling rig. This will permit the contractor to schedule his operations. It also encourages more favorable rates and better availability of suitable rigs.

Furthermore, once the contractor has made his rig available, drilling operations should not be delayed by the company. Delays are costly to both parties.

On the other hand, it is the contractor's obligation to provide equipment which is adequate for the job—equipment that is modern, of correct size and in good condition. He should

be prepared to carry out the operation in a workmanlike manner with efficient and trained personnel.

A third company obligation is to adhere to the drilling program as closely as possible and notify the contractor well in advance of any changes that are necessary. If these changes affect the contractor's cost, the price should be renegotiated.

At the same time, the contractor should advise the company of any drilling conditions, of which the company may not be aware, that would influence the operation. And he should be prepared to assume part of the drilling risks, such as hard formations, lost circulation, stuck drill pipe, etc. In this connection, it is imperative that his drilling supervisors be well trained and qualified to handle such problems.

However, the company is obliged to be fair and equitable in settling any situations that arise due to such mishaps or operations unforeseen at the time the contract was drawn.

Company Must Co-operate. A further obligation of the company is to co-operate and work with the contractor's personnel, using company employes who have drilling experience and understand the techniques and problems involved. The company also should be receptive to suggestions offered by the contractor.

In turn, competent contractors make a practice of co-operating with the company in developing new drilling techniques and utilizing methods which result in faster drilling time and reduced costs.

Finally, it is the company's obligation to pay invoices as promptly as possible. In most cases, this practice aids the contractor's cash position, lessens his need to borrow money, and results in a lower operating cost for him. In the matter of invoices, a careful check to avoid errors is an obligation of the contractor. The correction of errors is a time-consuming process for the company's personnel.

As stated earlier, it is not feasible for most oil companies to carry out their drilling programs with their own equipment. However, some operators do own and operate drilling rigs, despite the advantages offered by contractual drilling.

In some such instances, contractors' equipment of the type desired is not available, or contractors are not willing to perform under the conditions which the operator feels he must impose.

Another reason is that operators often prefer to use their own equipment and personnel where operations are unusually troublesome or hazardous.

Also, some operators feel they can best train drilling personnel with their own equipment, or they desire to study and make advancements in drilling techniques and feel it can best be done with their own equipment.

Where large drilling programs in a central location are foreseeable, it is sometimes more profitable to use a company-owned drilling rig. Often, in such cases, the rig is sold to a contractor when the program is finished. In some instances, the contractor is guaranteed enough work to pay out the rig. However, if this be the case, he usually is required to drill when and where he is asked and at rates competitive for that particular area.

Whether the companies maintain their own rigs or contract their drilling, most of them contract some portion of their drilling each year. As the trend toward contract drilling increases each year it is imperative that the company and contractor alike realize the huge responsibilities and risks that gradually are being assumed by the contractor. As in all contracts mutual good faith and respect is implied and not written. For the good of the industry harmonious relations should be nurtured and jealously guarded by both parties. —**The End**

DRILLING PROGRESS

Minutes are Money — Plan Your Well

Cooperation of all company departments, careful analysis of available information, delegation of responsibility and authority and a definite procedure insure a successful and economic operation.

By H. L. STRIDER
Zone Drilling Engineer
Gulf Oil Corporation,
Wichita, Kansas

A DETAILED drilling procedure for wildcat wells is being used by the Tulsa Production division of the Gulf Oil Corporation as a step toward achieving maximum drilling efficiency. Drilling expenditures constitute a large portion of the total outlay of funds for an oil producing company; means for improving drilling efficiency and thereby reducing these costs are being sought constantly.

1. What is a drilling procedure? A drilling procedure is a formal, written plan for drilling a specific well. It will vary in detail in accordance with the degree of departure from routine drilling practices in the area. It may be quite detailed for a deep remote wildcat well. For a development well in a known area, it may be no more than a brief letter setting out coring, testing, and logging programs.

Only drilling procedures for deep, complex wildcats are discussed here. They consist of:

- A graphical portrayal of drilling time profiles of selected pertinent wells upon which is superimposed an estimated drilling time profile of the proposed well.
- An estimated geologic column with formation names, tops, and characteristics indicated.

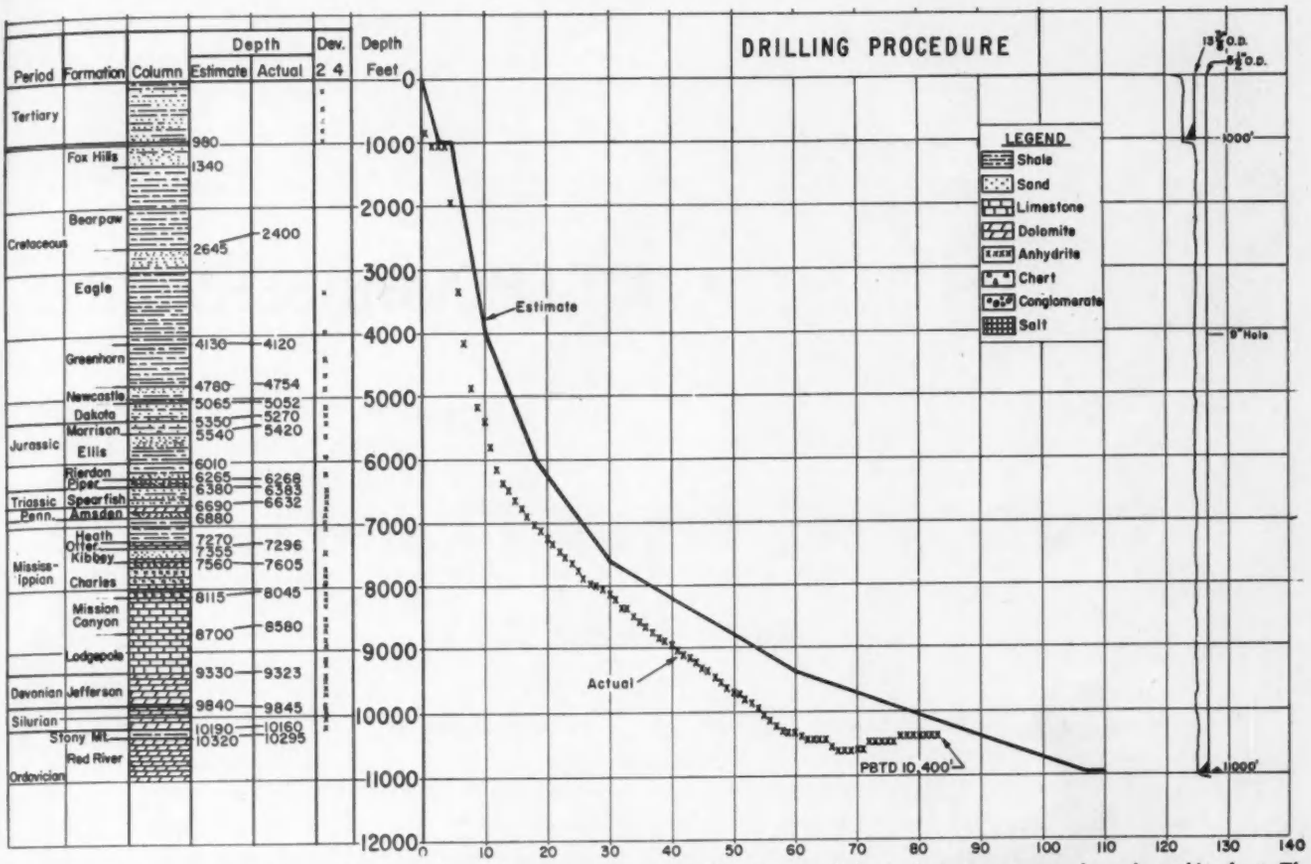


FIGURE 1—This is a typical drilling procedure. Formation tops, estimated drilling time, and the casing program are planned on this chart. The actual drilling time curve is added as drilling proceeds as are the actual formation tops and the bore deviation.

• A typed statement summarizing the drilling plans, hazards, and objectives.

Items covered in this summary are:

1. Location
2. Objectives
   a. Estimated tops
   b. Estimated coring
   c. Estimated drill stem tests
   d. Core head size
3. Mud program
4. Water supply
5. Casing program
6. Cement
7. Scratcher and centralizer program
8. Cellar controls
9. Core analysis
10. Logging
11. Anticipated subsurface conditions
12. Special drilling provisions

When advisable, certain of the above items are discussed in detail. This detailed discussion is typed on 8½ by 11-inch paper, attached to the drilling procedure, and identified as the Drilling Procedure Supplement. Such items as are expanded in the

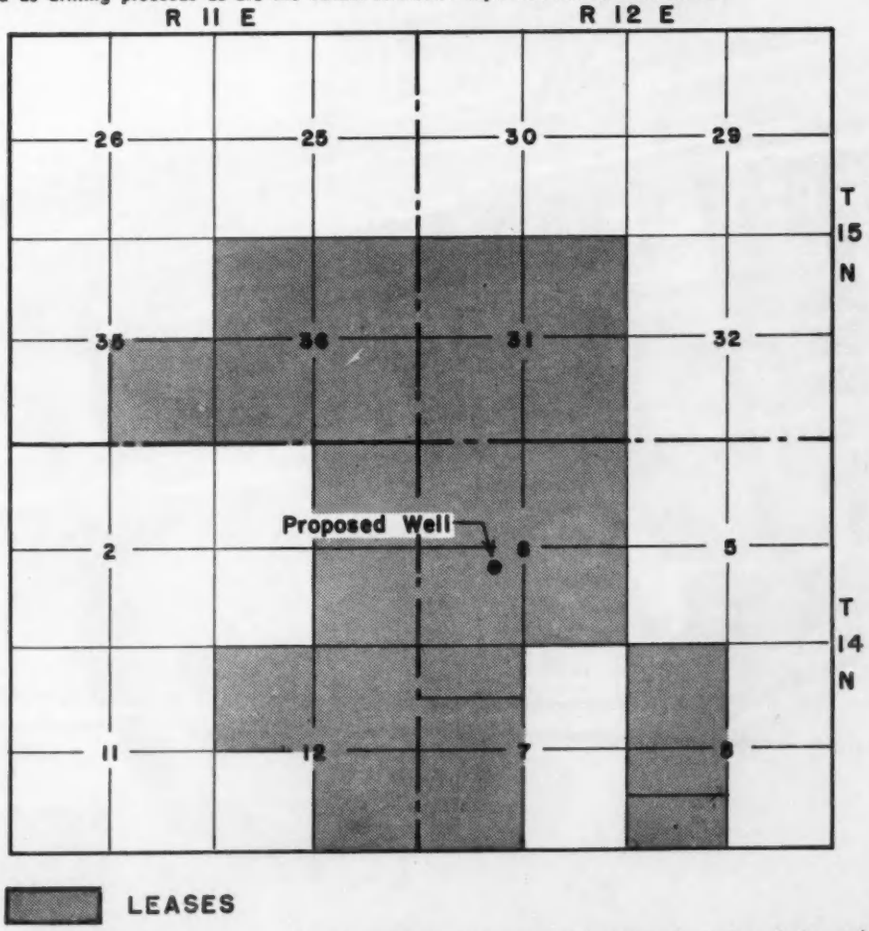
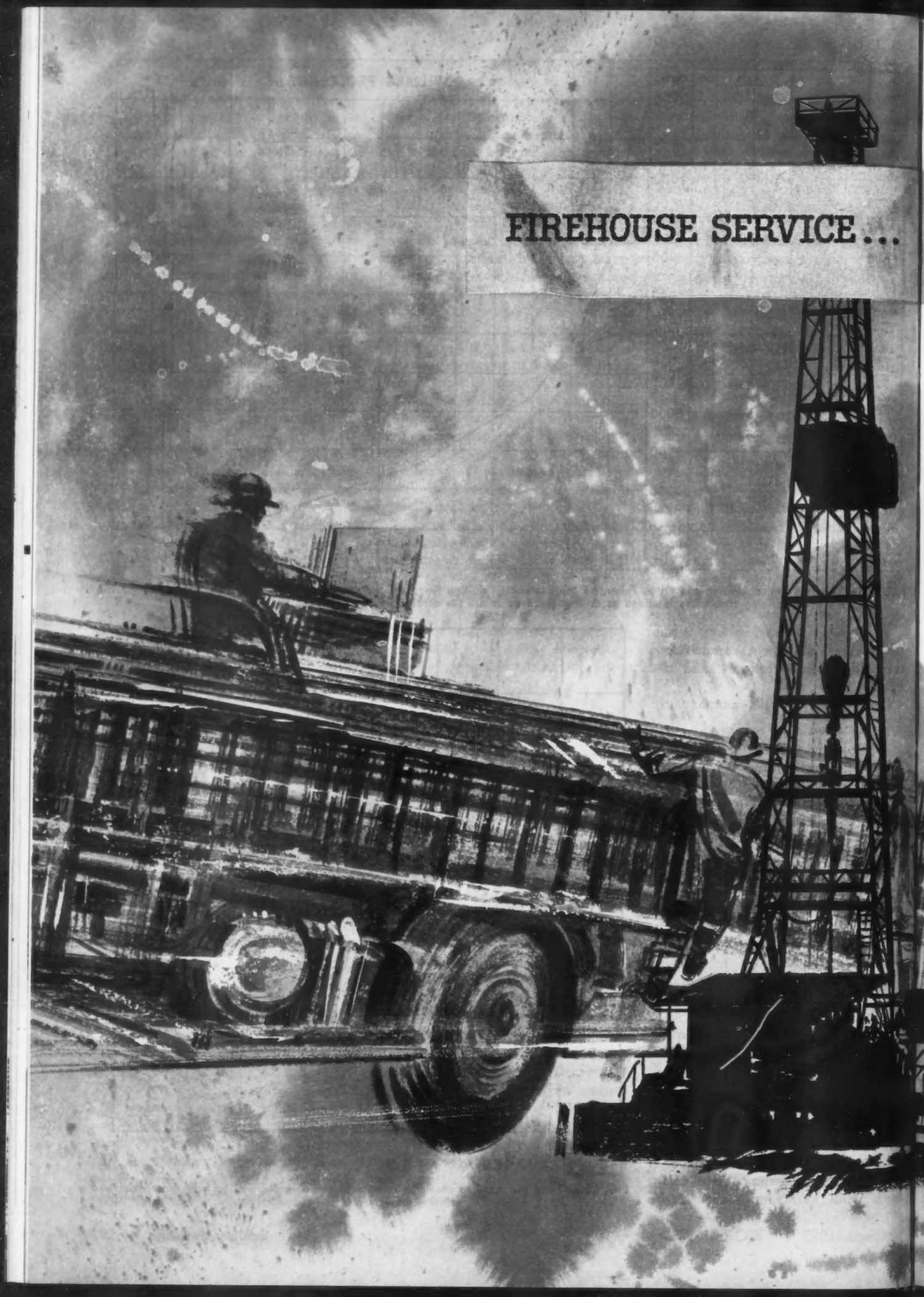


FIGURE 2—Land plat used to show the relation of the proposed well to lease boundaries and other acreage held by the operator.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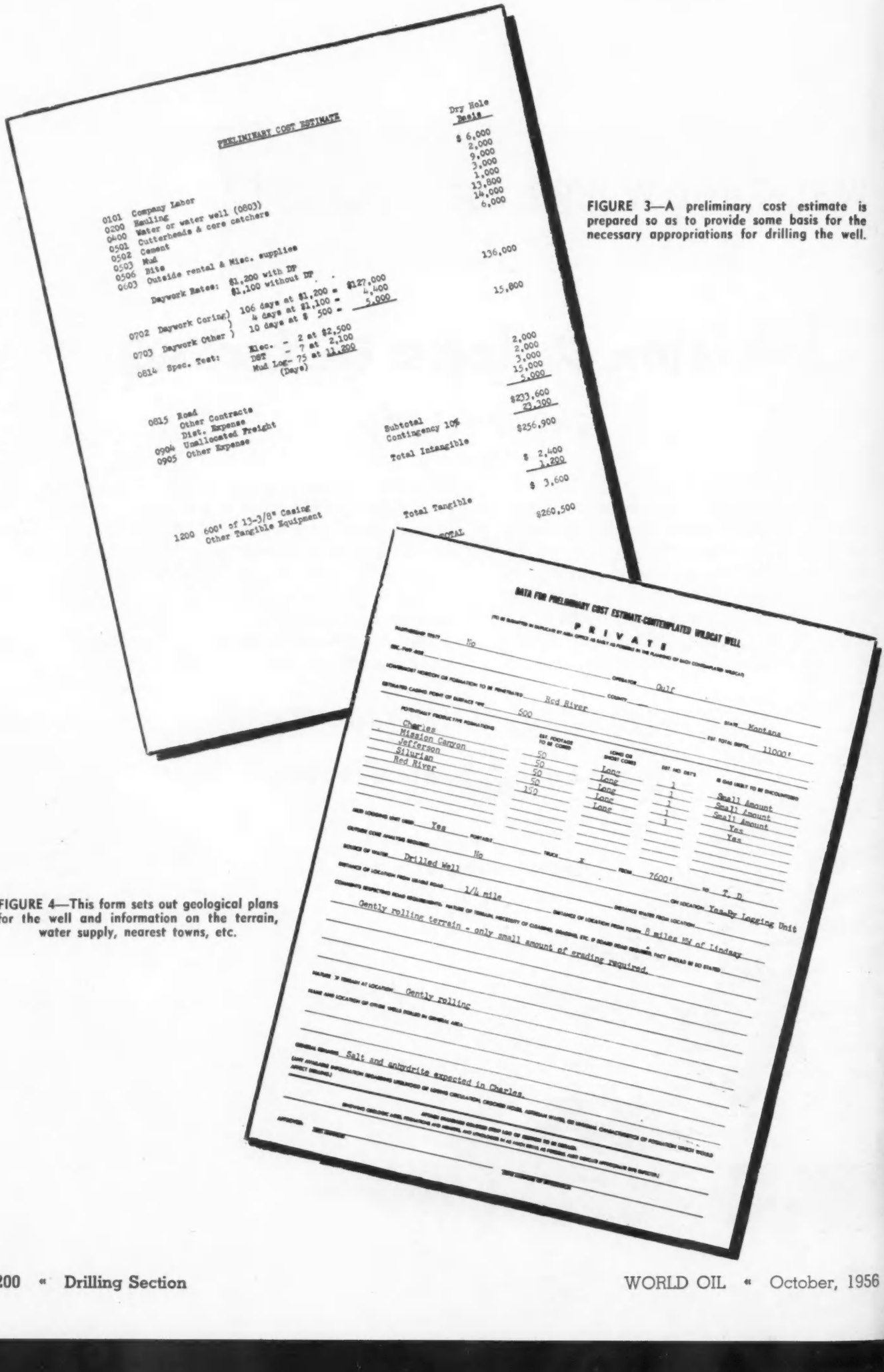


PRELIMINARY COST ESTIMATE

		Dry Hole Basis
0101	Company Labor	$ 6,000
0200	Hauling	2,000
0400	Water or water well (0803)	9,000
0501	Cutterheads & core catchers	3,000
0502	Cement	1,000
0503	Mud	13,800
0506	Bits	14,000
0603	Outside rental & Misc. supplies	6,000
	Daywork Rates: $1,200 with DP $1,100 without DP	136,000
0702	Daywork Coring) 106 days at $1,200 = $127,000 0703 Daywork Other) 4 days at $1,100 = 4,400 10 days at $ 500 = 5,000	15,800
0814	Spec. Test: Elec. - 2 at $2,500 DST - 7 at 2,100 Mud Log- 75 at 11,200 (Days)	2,000 2,000 3,000 15,000 5,000
		$233,600
0815	Road	23,300
	Other Contracts	
	Dist. Expense	
0904	Unallocated Freight	Subtotal $256,900
0905	Other Expense	Contingency 10%
		Total Intangible $ 2,400 1,200 $ 3,600
1200	600' of 13-3/8" Casing	Total Tangible $260,500
	Other Tangible Equipment	

FIGURE 3—A preliminary cost estimate is prepared so as to provide some basis for the necessary appropriations for drilling the well.

DATA FOR PRELIMINARY COST ESTIMATE-CONTEMPLATED WILDCAT WELL

P R I V A T E

Operator Gulf

County

State Montana

Est. Total Depth 11000'

Contemplated Casing Point of Surface 500

Potentially Productive Formations

	Est. Footage to be Cored	Long or Short Cored	Est. No. DST's	If Gas Likely to be Encountered
Charles	50	Long	1	Small Amount
Mission Canyon	50	Long	1	Small Amount
Jefferson	50	Long	1	Small Amount
Silurian	50	Long	1	Yes
Red River	150	Long	1	Yes

Mud Logging Unit Used Yes Footage

Outside Core Analysis Required No Truck X From 7600' to T. D.

Source of Water Drilled Well On location Yes-By Logging Unit

Distance of Location from Graded Road 1/4 mile Distance of Location from Town 8 miles NW of Lindsay

Operator's Proposed Road Development, Nature of Terrain, Necessity of Culverts, Grading, Etc. If Graded Road Required, Exact Method to be Stated

Gently rolling terrain - only small amount of grading required.

Nature of Terrain at Location Gently rolling

Name and Location of Other Wells Drilled in General Area

General Geology Salt and anhydrite expected in Charles.

Name Affiliation Information Regarding Unlocked or Lesser Circulation, Crossed Veins, Artesian Water, or General Characteristics of Formation Which Would Affect Drilling

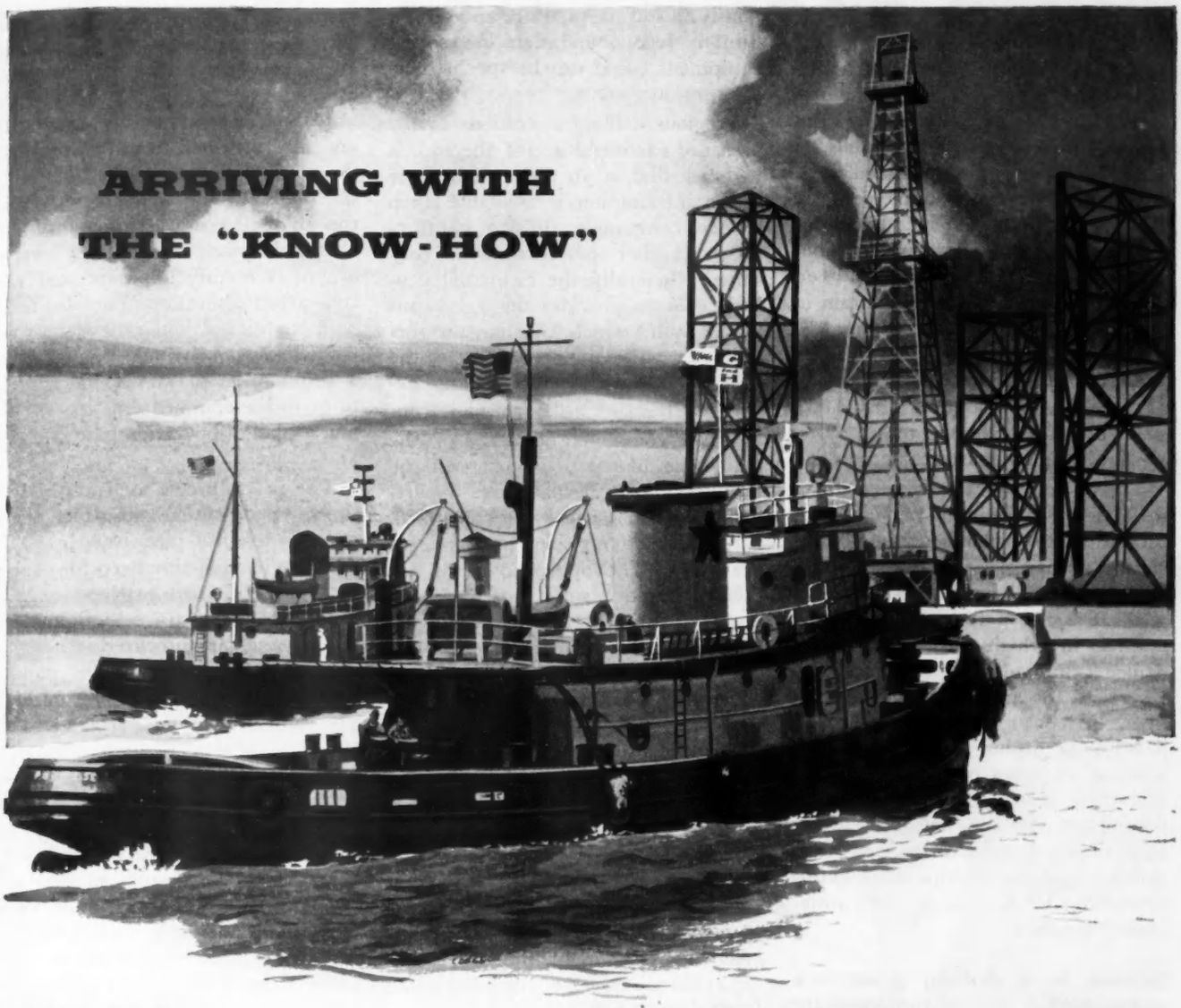
Other Proposed Related Joint Use of Roads to be Graded.

Drilling Geologist, Engineer and Operator to Set Forth Data as Formed and Obtained Information

Operator Title

Date Prepared

FIGURE 4—This form sets out geological plans for the well and information on the terrain, water supply, nearest towns, etc.



THE MEN:

Thoroughly experienced G & H towing crews . . . seasoned seamen who know and understand the treacherous wind and water currents offshore . . . take understandable pride in their skill at moving multi-million dollar drilling platforms such as Zapata Off-Shore Company's mobile structure "Scorpion." Pioneers in tidelands oil industry towing, this capable G & H marine experience pays dividends when spotting massive mobile equipment offshore.

THE EQUIPMENT:

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supplement are so indicated on the summary. Figure 1 shows a typical drilling procedure after the actual data have been added. This alone, without a supplement suffices for some less complex wildcat wells. A typical supplement is appended.

The procedure and supplement are bound in an 8½ by 11-inch folder for distribution. This constitutes a non-restricted copy. Several restricted copies are made up which contain in addition to the drilling procedure and supplement, an acreage plat (Figure 2) and a preliminary cost estimate (Figure 3). Distribution of the restricted copies is limited to appropriate Production department personnel.

The objective of the drilling procedure is to transmit all pertinent information to persons actually concerned with supervision of activities prior to actual commencement of the well. It is not a directive as to the manner in which the well is to be drilled; that ultimate responsibility rests with the area superintendent. It does, however, assist him in the discharge of his responsibilities by warning of zones of lost circulation, abnormal pressures, steep dips and consequent crooked hole difficulties, beds of mud contaminating substances; and by offering suggested procedures for combating these anticipated conditions.

2. How is a drilling procedure prepared? A drilling procedure for wildcat wells is prepared from data furnished by the Exploration department. The data consist of a hypothetical strip log of the section to be penetrated and an executed form, Figure 4, which sets out geological plans for the well and information on the terrain, water supply, nearest towns, etc. On rare occasions, a supplementary report is attached setting out in greater detail the zones of lost circulation, high pressure gas, and the expected fluid content of various critical strata.

An estimated drilling time profile, based on the geologic information received and consideration of other wells which have been drilled in the area, is constructed. A cost estimate is prepared from the drilling time estimate, casing program, etc. Detailed drilling plans are then developed which require coordination of mud and logging programs, design of casing programs with particular emphasis on surface pipe size and setting depth, recommendations on coring equipment based on the specific coring program, etc.

Previous drilling operations in the area are examined and if the well is to be drilled in an area where little or no information is available, then service companies, drilling contractors, and other operators may be consulted. Generally the estimated geologic column provides the significant facts around which all plans are formulated. The reaction of most of the rock is known through drilling experience in other areas.

When completed, a draft of the plan is circulated to members of the Production and Exploration departments for final check and approval. Any indicated revisions are made at that time. The approved plans are then prepared in sufficient copies and retained until the well is authorized, at which time the name of the well is stamped on the procedure and cover and the copies distributed. A revision of the procedure may be issued at any time during drilling operations if conditions warrant.

3. By whom is the procedure prepared? The drilling engineers do the physical work involved. The logging program is supplied by the reservoir engineers, often in consultation with geological personnel. The Exploration department, through the "Data for Preliminary Cost Estimate—Contemplated Wildcat Well," (Figure 4) indicates the zones where coring and drill stem testing will most likely be required. Consultation between drilling engineers and operating personnel is necessary to establish casing availability, from which design, setting depth and hole sizes are determined. The drilling engineer assembles and coordinates the information. He designs the mud program and negotiates any changes in originally furnished plans which might be required to permit the application of any specific drilling technique intended to expedite drilling operations. Actual issuance of the procedure upon well authorization is handled by the drilling engineers.

4. How is the procedure used? The drilling plans set out in the procedure are predicated on the geologic column anticipated. If substantial variation from the expected conditions develop, alterations in the plans are made. Alterations may originate at any level, but if above the Area office, the alterations are in writing, and are furnished to all recipients of the original procedure. Because all of the plans for the well are set out in the procedure the impact of any change in plans, at whatever level of origin, is readily apparent and well considered alterations may be made with confidence. The procedure is not an inflexible instrument. Rather it is a compilation of knowledge existing prior to the commencement of a well and a plan of operation based on that knowledge.

The procedure is used at the well site to check actual subsurface development against that predicted in order to identify any need for change in plans. Forward progress is compared to anticipated. Equipment and services are procured in advance of need with a minimum of standby time. Delays due to waiting on decisions and instructions are reduced because many decisions are made in advance.

Drilling emergencies are reduced. Insofar as possible, hazards are anticipated and preventative rather than remedial measures may be employed. Also material handling is expedited and better scheduling is achieved. The establishment of a drilling time target provides the drilling supervisor with a real sense of accomplishment if he can reduce the actual time substantially below the estimate.

The procedure provides the area superintendent with a comprehensive picture of the over-all job. The geologic column is presented in terms which stress the factors of importance to drilling progress without encumbrance with auxiliary data. Since the entire column is included, the supervisor need not constantly query the geologist for predictions. The drilling time profile usually assumes a flat slope through expected cherty or quartzitic beds. When encountered, the resultant decrease in daily footage needs less explanation because management has been prepared in advance for that eventuality.

Cost estimates are prepared on the basis of the estimated drilling time. If skillfully done they should suffice for the time indicated regardless of depth. In the absence of abnormal

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HOUSTON, TEXAS

RESEARCH ENGINEERING MANUFACTURING DEVELOPMENT

Observer's daily report of drilling activities at WELL NO. 1 for 24 hr. period ending 11:59 p.m. February, 1, 1955.

Total Depth Today 7200' Feet Past 24 hr. 135' Activity at report time today Drilling Weather Conditions Min.-21 Max.-32 °F. Snowing

Time Distribution to Nearest 1/4 Hr.

FROM SPUD TO TOTAL DEPTH:	Hours	Sub Totals
1. Operating Time:		
a. On bottom drilling (incl. connections)	17	
b. Trips (incl. bit change at surface)	3-3/4	20-3/4
2. Down Time:		
a. Replacements, major repairs		
Specify:		
b. Maintenance, routine repairs		
Grease		
Wait on: While:		
Repair: (I-1) (D-5)	1-3/4	
c. Fishing:		
d. Surveys, tests		
Slope test with		
Other:		
e. Mix mud		
Circulate for		1-3/4
3. Auxiliary Activities:		
a. Core (incl. trips)		
b. Ream (incl. trips)		
c. " O.D. casing, cementing		
d. Wait on cement, drill plug		
e. pick up, core barrel	1-1/2	1-1/2
4. ADDITIONAL ACTIVITIES (BEFORE SPUD & AFTER T.D.)		
a. Rig up		
b. " O.D. casing and cementing		
c. Wait on cement, drill plug		
d. Major repairs		
e. Routine maintenance		
f. Wait on: While:		
g. Fishing		
h. Surveys		
i. Production test		
j. Perforate, squeeze		
k. Tubing, surface connections		
l. Drill pipe, collars		
m. Other		
n. Tear Down		
TOTAL		24

Mail original to Wichita copy to Casper daily.

Operating Data

Maximum depth with " O.D. drill pipe today ' Drill pipe in use today, total 24 hr.

	Mud Pumps No. 1	Mud Pumps No. 2	Drilling Engines No. 1	Drilling Engines No. 2	Drilling Engines No. 3
Hr. Run	2	18-3/4	24	24	24
R.P.M.	50	50	1025	1025	1025
Liner	6-1/4	6-3/4			
Stroke	16	18			
G.P.M.	370	485			
PSI		1100			

Fuel diesel
Stock Fe:. 1-195 5 5695 gal.
Delivered today None gal.

Weight		Table	
Maximum	40,000 lb	90	RPM
Minimum	40,000 lb	90	RPM
Normal	40,000 lb	90	RPM

Drill Collars		All Slope Tests	
No.	15	Depth	Angle
O.D.	6-3/4	7064	3/4°
Total Length	453'		

Bit Record

No.	Size	Make	Type	Serial	In	Out	Feet	Hours	Bearings	Teeth	Remarks
17	9			84614	7064	7143	79	14-1/2	Loose	Worn	

Mud at 7120			Used Past 24 Hr.		
Weight	10.0	lb/gal	3	sx.	gel.
Viscosity	49	Sec.		sx.	Barite
	48	Cp.		sx.	Soda Ash
Filtrate	8.4	cc		sx.	Bicarbonate
Cake	3	/32"		lb.	Quebracho
Gel Initial	48	gr.		lb.	Caustic
10 Min.	48	gr.	10	sx	Starch
pH	6.8		30	lb	Preservative
Sand	1.2	%			
Chlorides	30,000	ppm			

Major Formation Changes, Geologists Tops
Top of Otter 7140'

" O.D. Set at ' With sx.

Tallies (from bottom up)

Jt.	lb/ft.	Grade	Class	Feet
		Totals		

Remarks: Summarize briefly activities, unusual or interesting developments; add clarifying details to equipment repairs; include repairs not affecting drilling progress, explain less than all engines operating; results of special tests, surveys, cement tops, etc. Use reverse side for additional space if needed.

No. 1 pump used to mix mud - 2 hours.
(I-1) Cut 50' Drl. line - 3/4 hours.
(D-5) Repaired oil line on cathead shaft - 1 hour.

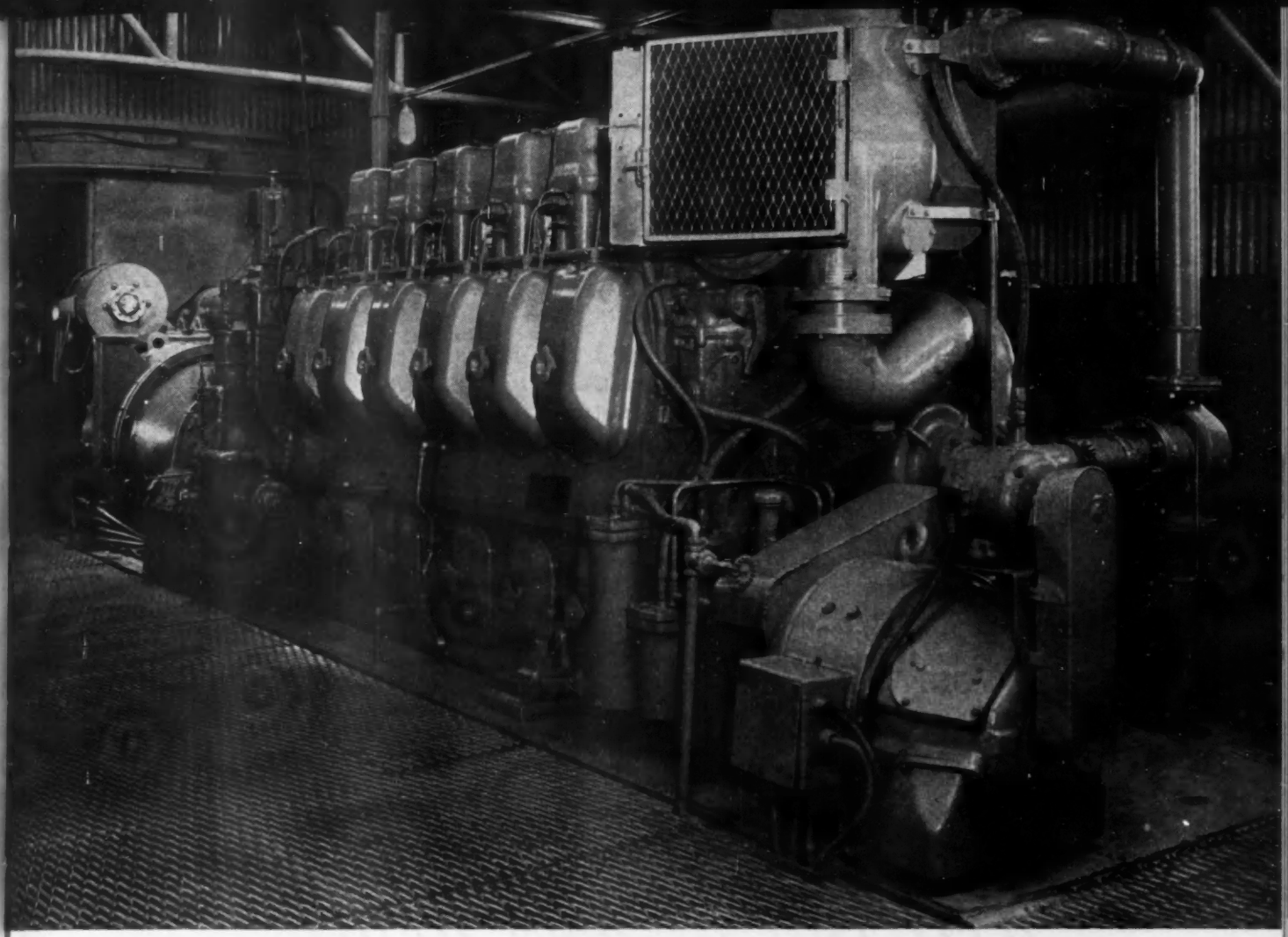
Cored

No.	Head O.D.	Type	From	To	Recovered

Signature John Doe

Signature

FIGURE 5—Observers daily report that is made out on each day's operations for all wildcat wells.



ALCO 251-B DIESEL ENGINE *in service on Shoreline Drilling Company oil-well drilling barge. Barge recently completed its second hole, which went 15,000 ft deep. First* ALCO *plant, owned by Bateman Drilling Co., has drilled over 80,000 ft. Offshore Company's first* ALCO*-powered rig has completed two holes. Drillers report excellent performance of* ALCO *equipment.*

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Plant Provides All Power For Drilling; Includes Split-Second, Reliable Control; Skid-Mounted Units Solve Weight Distribution and Add Flexibility.

The ALCO drilling plant provides all the advantages of diesel-electric power: smooth, pin-point control, steady acceleration without load shock to engines and other equipment, power that's instantly available. It means that you can spend more time drilling, less time in mechanical control changes and equipment maintenance. It even means that you spend less time changing bits, or pulling your string out of the hole for any reason. In addition, the ALCO plant can drill as long as one engine is running—it does not depend on auxiliary generators or engines.

All components are skid-mounted. You distribute weight on a barge as required, save setup time on land installations. Components can be trucked from location to location.

Two engines in the ALCO plant provide 1370 hp for draw-works drive and 600 hp for each of two mud-pump drives, plus power for lighting and other auxiliaries. A wide variety of modifications is available, such as larger mud-pump, rotary and coring reel drives.

The ALCO plant's cost is comparable to that of an ordinary plant. It is built and backed by the pioneer of locomotives and diesel-electric power. Contact your nearest ALCO representative or write P. O. Box 1065, Schenectady 1, N. Y. for details.

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When lower footage cost is more important than ever before, a Unit Rig offers greater opportunity for profit because each draw works is designed and built to deliver maximum efficient operation at its rated capacity.

UNIT RIG offered the first streamlined, compact and completely unitized draw works, and continues to incorporate into rugged draw works design all the features that make for more economical, efficient and trouble-free drilling operations.

Service and parts are never a problem for the operator of a Unit Rig. Qualified UNIT RIG service engineers and parts stocks are strategically located throughout the United States and Canada.

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for most economical drilling at any depth

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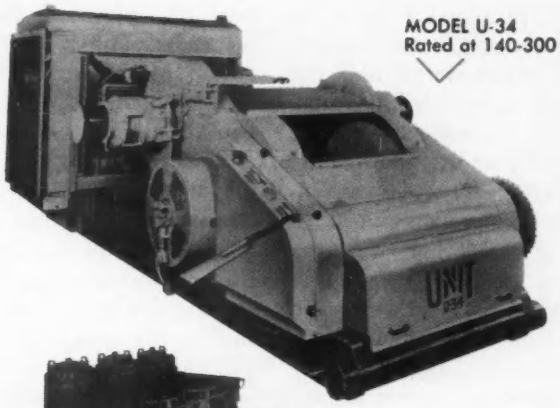
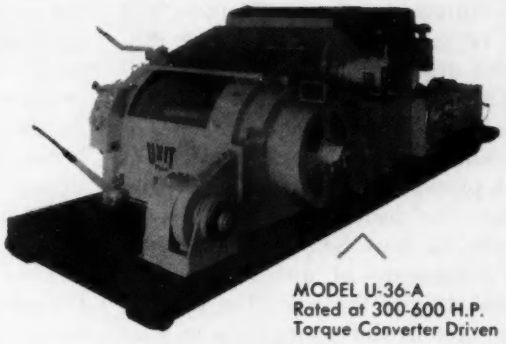
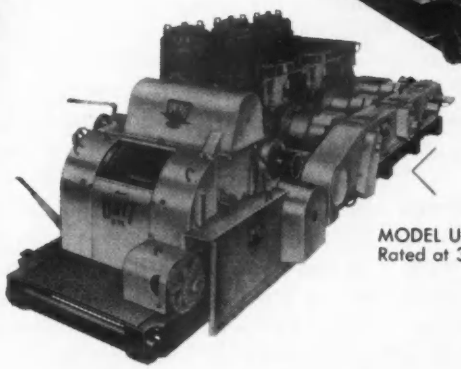


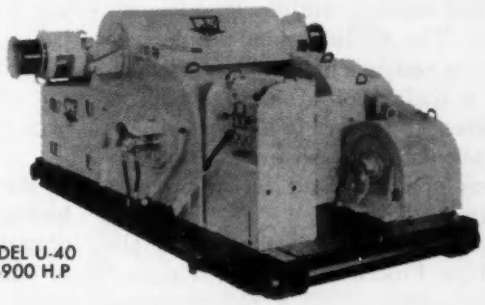
MODEL U-34
Rated at 140-300 H.P.



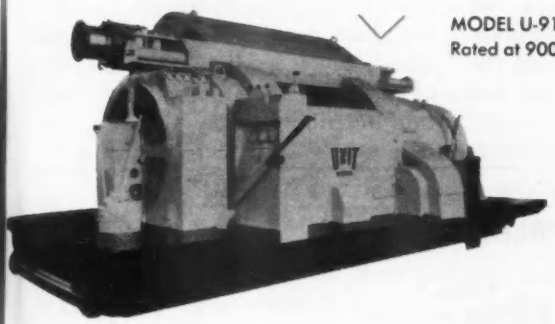
MODEL U-36-A
Rated at 300-600 H.P.
Torque Converter Driven



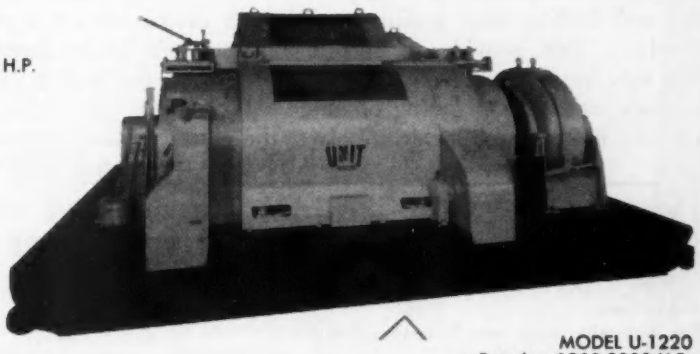
MODEL U-15
Rated at 300-600 H.P



MODEL U-40
Rated at 600-900 H.P

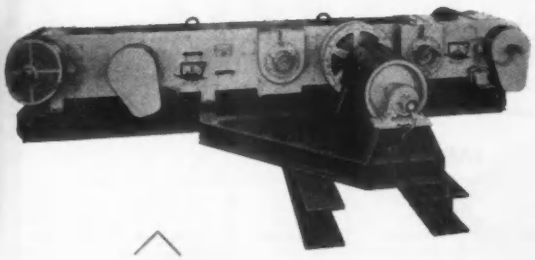


MODEL U-914-A
Rated at 900-1400 H.P.

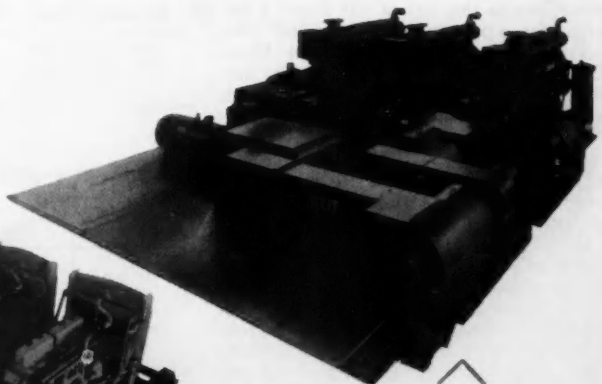


MODEL U-1220
Rated at 1200-2000 H.P.

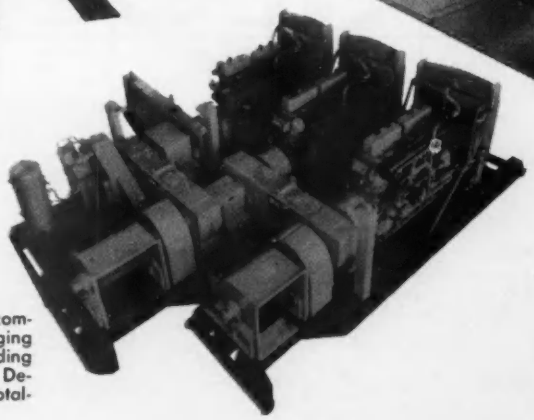
RIG *. . . designed for the job*



MODEL U-37 line compound drive unit for two or three engines totaling up to 1200 H.P



MODEL LS-1420-A two, three or four engine compound drive unit. Two-speed pump drive available. Designed with sectional or in line compound case for a combined horsepower up to 2000.



MODEL S-612-A swinging compound drive unit with swinging final drive and compounding cases. Two pump drives. Designed for 2, 3 or 4 engines totaling up to 1200 H.P

expenditures, authorized funds will not be exhausted prior to the estimated drilling completion date.

The acreage plat provides information which permits the area superintendent to plan surface installations with proper regard to future development. The position of the well with respect to lease boundaries indicates the seriousness of any large horizontal drift in the hole. The preliminary cost figures permit him to gage actual against authorized expenditudes. The drilling time profile provides a convenient means for receiving a daily plot of actual drilling progress and serves to alert the superintendent if any wide variation between predicted and actual progress begins to develop.

Actual data was plotted on the Drilling Procedure form of Figure 1 as the well was drilled. Actual formation tops, hole deviation, casing program, and drilling time profile were recorded. This provides a record which may be referred to as drilling progresses, or in the planning of another well in the same locale. Above the area office, principal interest lies in the depth at which formations are predicted and encountered and the predicted versus actual drilling time. At this level also, a wide divergence between predicted and actual drilling times immediately generates an interest in authorized versus expended funds.

The greatest possible asurance is provided that all modern skills and techniques are made available to each job covered by a drilling procedure. Considerable personal interest in each individual well develops in each person concerned with the preparation of a procedure.

5. How are drilling procedures being improved? An observer is placed on all important wildcat wells to record daily operating data and other significant information connected with the drilling of the well. Such information is reported on the "Observer's Daily Report" (Figure 5). When the well is completed the observer prepares a report covering the entire drilling operation. This report sets out mud, fuel, water, and bit costs, and generally discusses actual operations. Any unusual activities, such as lost circulation, mud contamination, water flows, etc., are detailed. Comparisons also are made of various equipment and techniques employed during the drilling of the well. Not only is a fund of general information provided, but specific recommendations are made which may apply generally or only to that particular area.

This report is distributed to appropriate Production department personnel for information and inclusion in their copy of the drilling procedure on the particular well. The background of information and data furnished by this report serves to assist in the preparation of drilling procedures covering future wells in the same area or wells where subsurface conditions are comparable. As the knowledge level increases, advance planning may be made more precisely, which leads to greater drilling efficiency with a consequent reduction in drilling costs.

DRILLING PROCEDURE SUPPLEMENT

2. Objectives

The objective beds are limestones and dolomites and an estimated 350 feet of coring will be required. If continuous coring does not exceed the length of the core barrel, reduced diameter coring and reaming is indicated. However, if a substantial amount of continuous coring exceeding core barrel length is expected, consideration should be given to full hole coring.

3. Mud

A fresh water base mud will be used from surface to the top of the Piper Lime expected at approximately 6265 feet. Shales extending from surface to about 5000 feet are bentonitic in nature and probably as much as 1000 to 1500 barrels of water per day will be required to maintain the solids content of the native mud at an acceptable value. Some trouble has been experienced in the area with tight hole through the Dakota sand section when drilling with a relatively high water loss mud. To prevent this from occurring in this well the filter loss should be reduced to a value ranging between 10 and 15 cc's before reaching the Dakota sand top, which is expected at 5065 feet. Probably the most economical method of effecting this filter loss reduction is through the use of phosphates. Sodium tetraphosphate has been used in this area for this purpose with good results.

Anhydrite and salt are expected in the Triassic and Mississippian formations and there is a distinct possibility of encountering the salt in massive beds. The mud system should be converted to a gypsum base mud before reaching the Spearfish. Probably, the conversion should be started

TABLE 1
5½" OD to 11,000'

From	To	Feet	Weight	Grade	Thread	SAFETY FACTORS	
						Collapse	Tension
11,000	7,500	3,500	23	N-80	LT&C	1.62	High
7,500	6,000	1,500	20	N-80	LT&C	1.82	3.46
6,000	1,800	4,200	17	N-80	LT&C	1.63	1.75
1,800	100	1,700	20	N-80	LT&C	High	1.76
100	0	100	23	N-80	LT&C	High	2.02

Pipe required for this string is:

DESCRIPTION	Installed Length	Thread Makeup	Order
23 lb. N-80 LT&C	3,600	36	3,636
20 lb. N-80 LT&C	3,200	32	3,232
17 lb. N-80 LT&C	4,200	42	4,242

TABLE 2

From	To	Feet	Weight	Grade	Thread	SAFETY FACTORS	
						Collapse	Tension
11,000	10,100	900	20	N-80	LT&C	1.370	High
10,100	7,000	3,100	17	N-80	LT&C	1.133	High
7,000	5,200	1,800	17	J-55	LT&C	1.125	2.71
5,200	2,700	2,500	15.5	J-55	LT&C	1.133	1.76
2,700	200	2,500	17	N-80	LT&C	High	1.75
200	0	200	20	N-80	LT&C	High	2.05

Pipe required for this string is shown in Table 3.

TABLE 3

DESCRIPTION	Installed Length	Thread Makeup	Order
20 lb. N-80 LT&C	1,100	11	1,111
17 lb. N-80 LT&C	5,600	56	5,656
17 lb. J-55 LT&C	1,800	18	1,818
15.5 lb. J-55 LT&C	2,500	25	2,525

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when the Piper Lime is encountered. Filter loss should be maintained at 5 cc's or less to minimize sloughing of shales in the upper part of the hole. If and when there is evidence that a massive salt bed is being penetrated, the mud should immediately be saturated with salt to minimize further dissolution of formation salt. Under these circumstances a salt saturated mud will have to be carried to total depth.

No lost circulation or abnormal pressures are expected, but mud should not be allowed to go below 9.5 ppg or above 11 ppg unless existing conditions dictate otherwise.

5. Casing

The surface pipe will be 13⅜-inch OD and will be set at approximately 1000 feet. Although no additional casing is planned above total depth, the opportunity exists for reaming to 12¼-inch and running 9⅝-inch OD if the need develops. A 9-inch hole will be drilled below the 13⅜-inch OD. The production string, if needed, will be 5½-inch OD if no further drilling is anticipated subsequent to running the production string.

Several instances of casing failure have occurred opposite salt sections in wells in the Williston Basin. One practice now employed to combat this problem is running casing through the salt sections having a collapse resistance approximately twice that normally run. There is a possibility that relatively thick salt beds will be encountered in this well. In this event, the string shown in Table 1 will be adequate to a depth of 11,000 feet.

If salt beds are not present, the string shown in Table 2 will be adequate.

6. Cement

The 13⅜-inch OD surface pipe should be cemented to surface with common portland cement. Cement waiting time will be 24 hours.

If the production string is run and formation temperature is above 150° F., or more than 90 minutes is required to mix and place the cement, a slow-setting cement should be used. Additionally, if massive salt beds are exposed, the cement should be mixed with saturated salt water or with sufficient bulk salt to saturate the mixing water. Sufficient cement should be used to cover salt beds.

8. Cellar Controls

3000 psi working pressure blowout preventers should be installed on the 13⅜-inch OD casing head. If pressure-operated preventers are used, some means other than the mud pump should be provided to power the hydraulic fluid. If the preventers are manually operated, heat should be provided to prevent the accumulation of ice, which would hamper proper operation.

10. Logging

The gamma ray and neutron survey, self-potential log, laterolog, caliper and temperature survey should be run from shoe of surface pipe to total depth. The microlaterolog need not be run through thick shale beds. The caliper and temperature surveys will be run prior to running the production string or abandonment of the well.

The Casper Production office will have the responsibility of procuring and installing a fluid logging trailer. This unit will be used from 7600 to total depth.

11. Special Drilling Provisions

There is a possibility that massive salt beds will be encountered in the Spearfish and Charles formations. If these beds are encountered, jet bits should not be used in drilling them and circulation rates should be reduced to minimum required to return cuttings. These measures, if used, will minimize hole enlargement through the salt beds, thereby possibly decreasing the hazard of crushed casing due to flowing salt.

DRILLING PROGRESS

Cooperation and Planning Can Mean Profit for Everyone

The Elk City field can serve as the model and the goal for profitable harmonious relations between the operator and the contractor.

How much drilling will a dollar buy?

For an oil producer, the answer can only be—it all depends.

It depends partly on where the hole is to be drilled, and how deep. On field development wells, it may depend even more on how wisely the producer plans ahead before he spends his money.

When a successful wildcat opens a new field, it also opens the way to a multi-million-dollar expenditure for drilling. Many producers have learned that these dollars can be stretched over more feet of hole by working and cooperating closely with the contractors they hire.

An example of the success of this principle was Shell Oil Company's development program for the deep Elk City field in Beckham and Washita counties, Oklahoma. One of many large drilling campaigns of recent history, the Elk City program emerges as a significant success story of economical development and harmony in operator-contractor relationships.

When the final field well was completed in 1954, 237 wells had been drilled, each more than 10,000 feet deep. Total cost of the drilling program was $35,184,000, with an average cost per well of $148,500.

The profits of teamwork between the operator and the contractors are indicated by the cost figures:

- Footage prices dropped from $9.50 on the early development wells to a field price of $6.75 established in 1950.
- Over-all drilling costs, which averaged more than $218,000 for the first ten field wells, were cut by a whopping 42 percent by 1951, when the drilling program was in full swing.

Equally important reductions were effected in average drilling time. Time averaging 98 days was required to drill the first ten field wells, to a depth range of 9800—10,600 feet. Taking 10,000 feet as a factor common to all wells, the 1949 average of 77 days was trimmed to 38 days during 1953 and 1954.

The drilling program stands out as an example of orderly and economical large-scale development.

In the memory of the seven drilling contractors who were employed in the field, Elk City remains a model of sensible practice, fair profits, and steadily improved efficiency.

Both the company and the contractors credit two factors for the assembly-line efficiency of the drilling program: pre-planning, and two-way cooperation.

Gearing up. A major drilling development program was heralded in late November, 1947, when Shell

completed the J. G. Walters 1 in the middle of a cotton patch five miles south of Elk City.

It had taken 15 months and $773,747 to drill the first well, which was bottomed at 13,133 feet. The last 3,000 feet had been cantankerous, with high subsurface pressures in formations below the Missouri (Hoxbar) causing endless difficulties. (The well was finally plugged back and completed as a gas condensate well through perforations at 9260-9360 feet, as it was later determined that the deeper formations contained only small amounts of gas.)

Following completion of the costly discovery well, Shell proceeded with caution. Before plunging into a drilling program, a great deal of research was to be done. Walters 1 was a guidepost, but the trail was yet to be blazed.

Geological and reflection seismic data had indicated a major field, but it remained to learn the actual extent of the oil-bearing Hoxbar interval. For almost a year Shell engineers turned their attention to examining the reservoir data thus far obtained.

With the evident possibility of an important producing field, it was essential to look ahead. Field and area staff men met in a series of conferences to evaluate the drilling data, and proposed a tentative drilling schedule.

It was also necessary to make immediate plans for efficient production and gathering methods. As the principal operator in the field, with a 75 percent working interest, the greatest responsibility for development fell to Shell Oil Company. Other companies operating in the field included United Carbon Company, E. Constantine, Wilcox Oil Company, Union Oil Company, Tidewater Oil Company, The Superior Oil Company, Max Pray, Continental Oil Company, and J. M. Huber Corporation.

Research indicated that maximum recovery of hydrocarbons from the complex gas-condensate-oil Hoxbar reservoir could be accomplished only by cycling or pressure maintenance operations. Proposed plans were laid for construction of a liquid extraction plant, compressor facilities, pipeline outlet, and suggested unitization.

Now it was time to go forward with the exploratory drilling program. In the fall of 1948, Shell contracted for two wells on locations due west and due south of the Walters discovery, in a 640-acre step-out pattern.

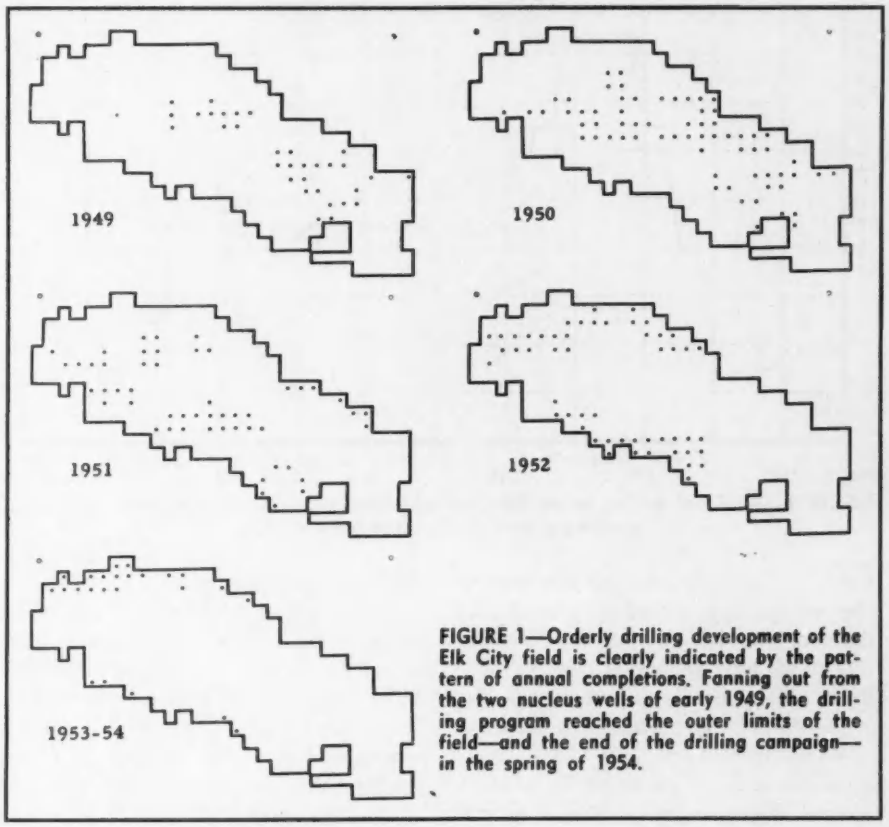


FIGURE 1—Orderly drilling development of the Elk City field is clearly indicated by the pattern of annual completions. Fanning out from the two nucleus wells of early 1949, the drilling program reached the outer limits of the field—and the end of the drilling campaign—in the spring of 1954.

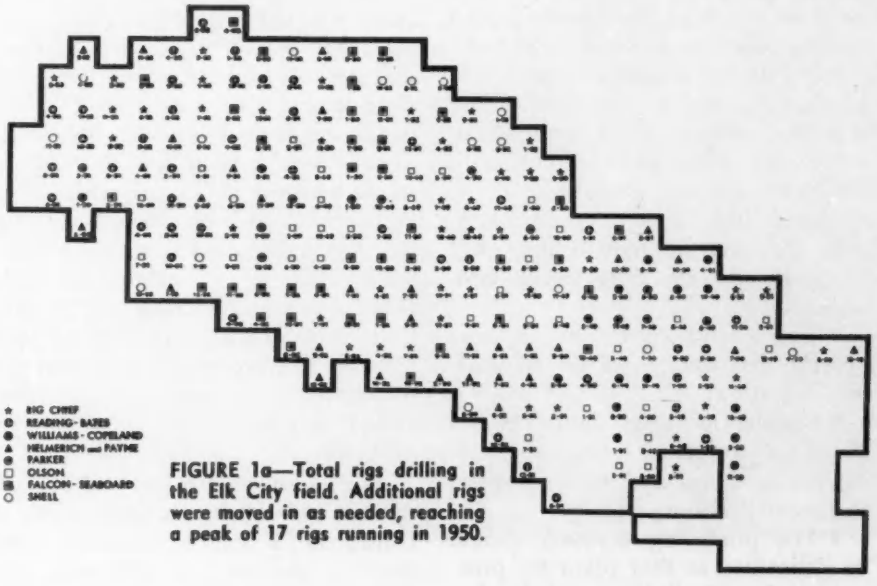


FIGURE 1a—Total rigs drilling in the Elk City field. Additional rigs were moved in as needed, reaching a peak of 17 rigs running in 1950.

In February, 1949, the full-speed-ahead signal went up with completion of the western extension, J. I. Long 1, as an oil producer. This well confirmed information already gathered on reservoir characteristics and the value of the discovery, and launched the drilling campaign on a full scale.

Another vote of confidence was cast the following month, when the southern step-out, O. L. Kelly 1, was brought in to form the second nucleus of oil production.

Up to this point, many company man-hours had already been spent in the preliminary planning stages of the new Oklahoma field. However, in the early spring of 1949, no one could predict the full extent of the drilling operations.

By the end of 1949, only 14 completions had been made, but they were spaced over a distance of four

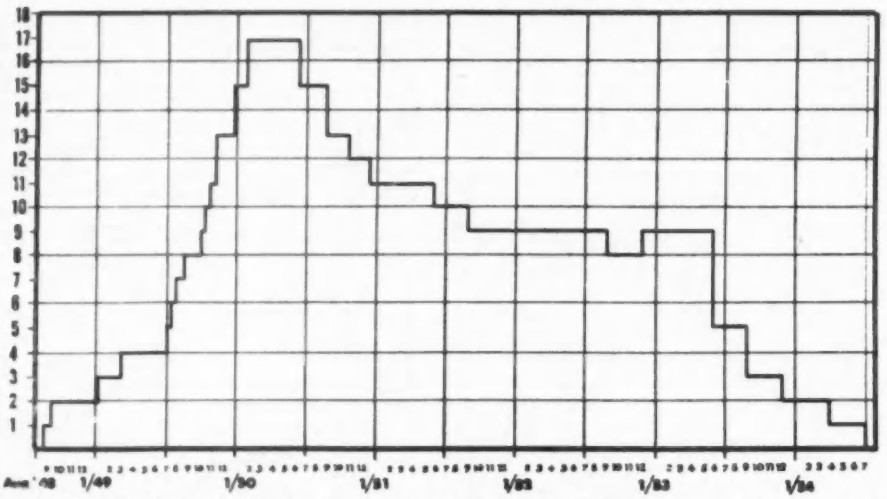


FIGURE 2—Total rigs drilling in the Elk City field. Additional rigs were moved in as needed, reaching a peak of 17 rigs running in 1950.

miles—a tangible clue to the size of the oil-bearing structure. As finally defined, the Elk City field extended 8½ miles long by about 3 miles wide in a northwesterly direction, on the south flank of the Anadarko Basin.

Wells drilled in late 1948 were semi-exploratory step-outs, widely spaced. Then in May, 1949, a 40-acre drilling program was begun. The eventual result of the closely-spaced drilling was 2.5 million feet of hole.

In 1950, the drilling program was accelerated and 65 wells were drilled that year (Figure 1). The rapid development rate was continued until the final well was completed in the spring of 1954.

In planning this mass drilling program, there were three prime considerations:

- There should be rapid, but orderly, development of the oil-bearing formation;
- Drilling locations should be selected to protect the leases with early expiration dates, and to meet offset drilling obligations; and
- The producing reservoir should be delineated so that plans for processing plant facilities could be formulated.

Governed by these provisions, it is informative to review how Shell set about the task of developing the Elk City field.

Letting the contracts. Inventory was the first step in selecting contractors to work in Elk City. In the summer of 1948, Shell surveyed the area for drilling firms with equipment adequate and suitable for the deep drilling tasks in the new field. Selecting a list of ten contractors, Shell outlined the proposed drilling program and invited them to bid.

While prices for footage and daywork were factors in selecting the seven firms that worked at Elk City, bids were also scrutinized to determine the qualifications and financial responsibility of the individual firms, and the availability and type of equipment they proposed to use.

An important early decision was to limit the number of contract rigs operating in the field to a minimum and sufficient number to carry on the development pace. Additional rigs would be moved into the field only as they were needed, and rigs already in the field would be kept working.

The plan, as it became a fact, gave the contractors assurance that they were in line for extended work with their rigs, provided they met the requirements of the program. This confidence contributed greatly to the atmosphere of teamwork that prevailed throughout the development program.

As one contractor put it, "It's almost a rule-of-thumb that where a contractor is able to maintain continuous operation, his efficiency will be increased and his over-all operational costs will be reduced."

The first rig in the field was operated by Olson Drilling Company, on the Walters exploratory well. An Olson rig was also employed to drill the second well, which triggered the large scale campaign.

Second in the field was Big Chief Drilling Company, followed by Williams-Copeland (now Kidd Williams Drilling Company), Falcon Seaboard, Helmerich & Payne, Reading & Bates, and Parker. At the peak of drilling activity, in the spring of 1950, there were 17 rigs running, including one company rig (see Figure 2). A Shell rig was brought in primarily to conduct experimental work for the benefit of the contractors.

In the fall of 1949, a major decision was made to standardize the hole size. The first exploratory holes drilled were large diameter to facilitate testing. With this need past, it was possible to reduce the hole to a standard 7⅞-inch size to permit faster drilling at lower cost. This meant that all field wells would be on the same basis, and interchangeable so far as bidding was concerned.

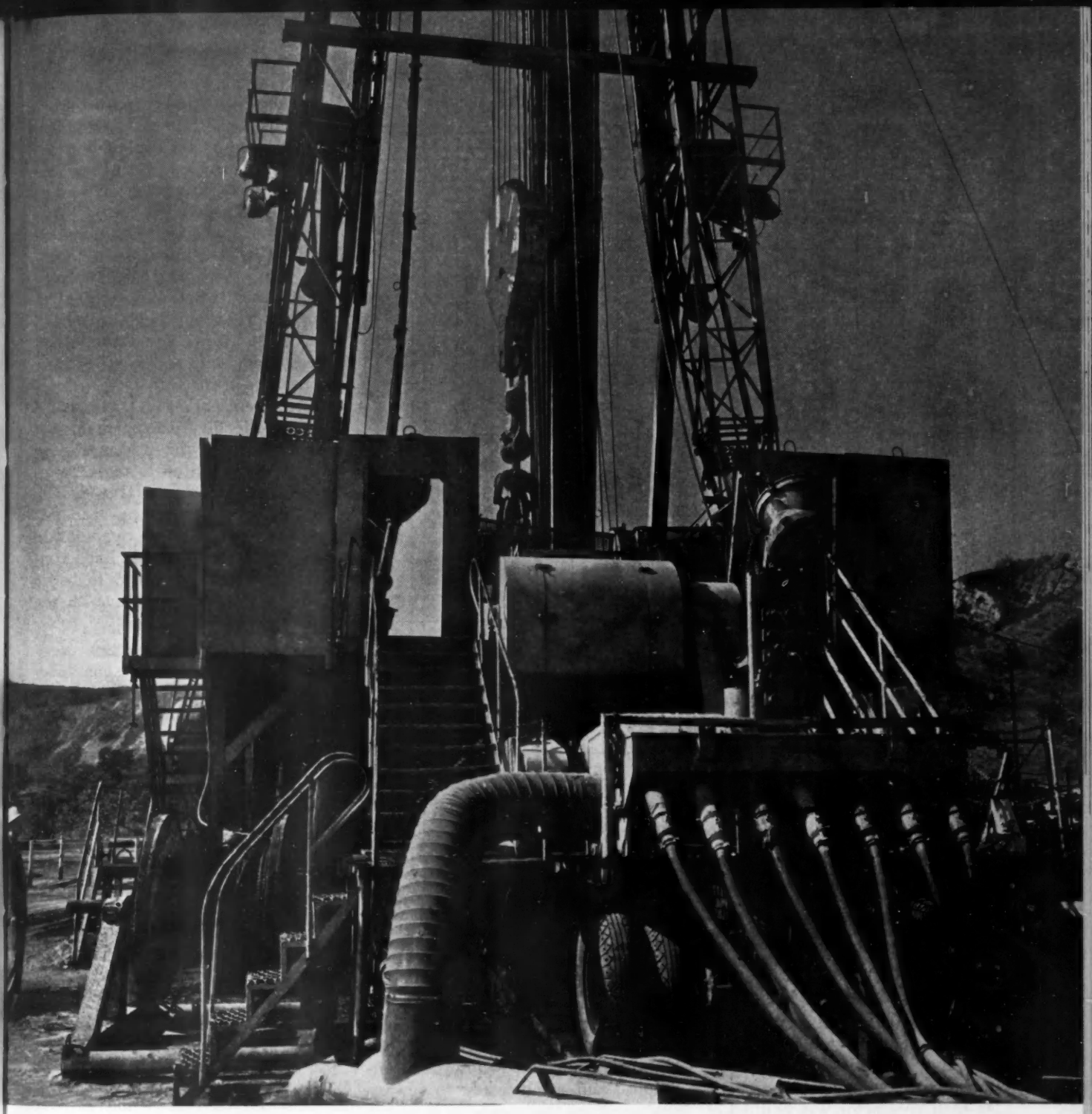
Letters soliciting bids specified a well location, but it was understood by all contractors that the bid might apply to any well in the Elk City field except a step-out location. Changes in location were anticipated due to (1) delays in securing approvals; (2) legal difficulties in obtaining title clearances; and (3) delays in drilling-in of a well from which a rig was scheduled to move.

In choosing locations and contracting for each well, a pattern was followed throughout the development program. Sites for proposed wells were selected to meet offset obligations, and to continue to define the field limits. The order of development was also influenced by the number of months the offset well had been producing, and the estimated pay thickness of undrilled locations.

Field personnel submitted drilling recommendations well in advance of actual need. In field and division production offices, large wall charts of drilling progress on each well were posted each day (Figure 3). In addition to a running record of the current depth at each location, the charts also indicated approved future drilling locations. At a glance, the company field men could see how soon a rig would be available for the next job.

The next move. By and large, the contract for each well was let to the contractor with the nearest available tools. This logical system enabled the contractor to skid his rig to the next well site, with minimum time for dismantling and hauling the tools. Reduced transportation expenses were the natural result, and were reflected in the steady downward trend of drilling costs (Figure 1A).

Soon after a drilling location was approved, bulldozers moved in to



Wire Rope at Work—Of interest to drilling men is this all-electric rig owned and operated by the Shell Oil Company. When photographed, it was redrilling a 12,500-ft well that had ceased producing in profitable volume. The locale of the job was the rugged, hilly country northwest of Ventura, California.

The rig is controlled by a series of push-buttons arranged on an operating console. It uses the familiar jackknife type of mast, 136 ft high. For the job shown in the photograph above, the outfit was equipped with 2500 ft of Bethlehem wire rope, 1¼-in. diam, Purple Strand grade. A very sound choice, for Purple Strand has the high strength needed in deep drilling, as well as the toughness and dependability that mean a long and useful life.

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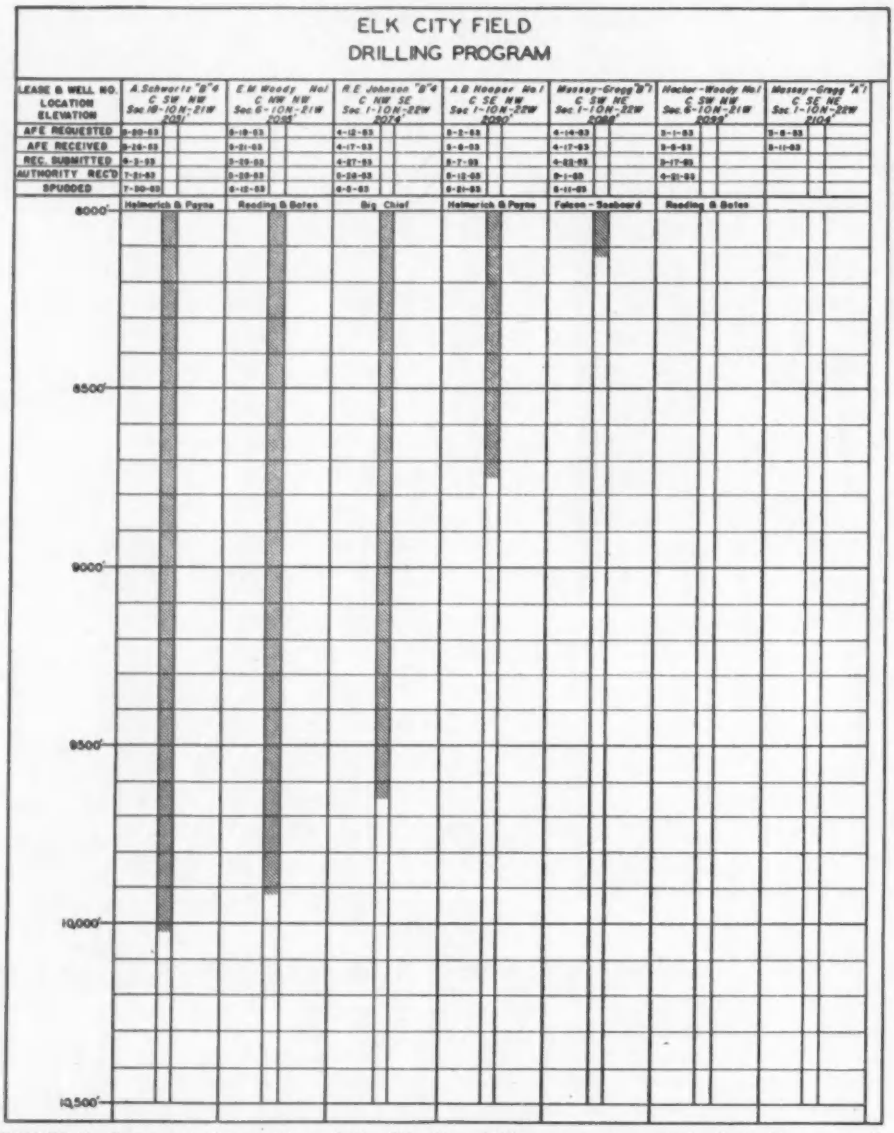


FIGURE 3—Representative section of the Elk City drilling progress control chart. Data on all current wells—both drilling and proposed locations—were posted daily on the large wall charts. When a new location was approved, as a general rule the job was let to the contractor with the nearest available rig.

build roads to the site. The roads were carefully routed to reduce damage to the land and crops—a plan which also protected the company's relations with the landowner.

As each contractor was notified of his next location 30 days or more in advance of the drilling date, he was able to get much of the preliminary work out of the way before he moved in with his heavy tools. Some of the equipment used only in spudding in, such as large drill collars and rathole machine, could be hauled to the new site, ready for the job. He could dig reserve pits, lay water and gas lines, and complete the future location before the rig had finished drilling operations on the current well.

Facts at hand. Shortly before the time the new well was to be spudded in, Shell gave the contractor a sheaf of data sheets on the operation.

Company engineers made it a point to inform each contractor of all known or anticipated subsurface conditions—and stood ready to answer any questions that might arise in the course of drilling. The company drilling superintendent, geologist and mud engineer were always available to work on routine or emergency problems.

Both written and schematic prognosis sheets, such as those shown in Figure 4, were posted at the rig for the guidance of the toolpusher and driller. At any stage in the drilling process, the contractor's men were able to spot-check the program for casing, logging or mud requirements.

Each contractor also received a current well schedule (Figure 5). This bulletin listed locations and contractors working, and the names of contractors' toolpushers and Shell field personnel. Names of the Shell production foreman, exploitation engineer and mechanical engineer assigned to each job were readily available for quick reference.

This free exchange of information put Elk City operations on an "open-book" basis. Not only did the contractors know what was expected of their own firms, but they also knew a great deal about the "who, what, where, when, why and how" of their competitors in the field.

Shell conscientiously promoted a spirit of friendly rivalry among the contractors, believing it was a good idea to spur them on to make better time. It was. Comparative drilling time records were kept on each job, and the field average was made known to the contractors. Each contractor became determined to better his own record and improve on the field average drilling time.

Crews pitch in. The drilling crewmen also felt a personal responsibility for keeping pace with the rig on the next forty. To a man, the contractors interviewed reported that high employe morale and interest in the program were significant in lowering drilling time and costs.

With a large pool of qualified crewmen, the contractors were able to select the best men, train them, and keep them on the job. Because the efficiency of drilling depends so greatly on the men working the tools, it naturally follows that the more experience they have, the better work they do. This maxim proved true at Elk City. As the men continued to grow into their jobs, they were better able to keep the drilling operations in high gear.

Over the five-year period, working in the field became a steady job for many crewmen. Personnel turnover was negligible. Most of the men lived with their families in the town near the field, and became active in community affairs. Housing problems, critical in the early stages of development, were eased as the townspeople came to accept the newcomers as welcome citizens.

Drilling in. Assisting contractors to find living quarters for their men was one phase of the operator's continuous theme of "cooperation to get the job done." Economically and technically more important were the com-

pany's cooperative efforts to improve the efficiency of the actual drilling operation.

The requirements of the contractors were explicit: get the hole drilled, as quickly and economically as possible. At the same time, the company believed that it was good business to enable the contractors to make a reasonable profit on their work. To this end, Shell made every effort to eliminate time losses due to non-drilling work.

As more was learned about the nature of the pool, many operations became standardized throughout the field. Practices were adopted that enabled the drilling firms to make footage contracts to 10,300-foot depths.

A time-and-money saving system was the use of an intermediate string of casing through the salt section to approximately 2800-3100 feet. By preventing contamination of the mud system from this formation, the drillers were able to use an inexpensive fresh water-clay mud in drilling below the salt.

Within reason, the contractors were permitted to specify the mud program on the intermediate hole, and until the potentially productive zone was approached. However, the mud program was based on a company-recommended "prescription" and kept under constant surveillance by the company mud engineer.

One of the greatest time-savers was the use of a special rig for completions. Shell contracted with Beckman, Inc., for this service. Arrival of the small workover rig released the big rotaries immediately after setting the oil string of casing. As Beckman completed the well, the big rig skidded over and began spudding in at the next location.

Quickening the pace. Engineering studies of the drilling program began with the first well and were carried through to the end. The company-operated rig was used as an experimental station and became an important factor in the steady improvement.

Many innovations were first tried on the Shell rig. As the new ideas were proved, they were made immediately available to the independent contractors.

As shown in Figure 6, a sharp drop in drilling time occurred at year-end, 1952, when the jet bit was introduced.

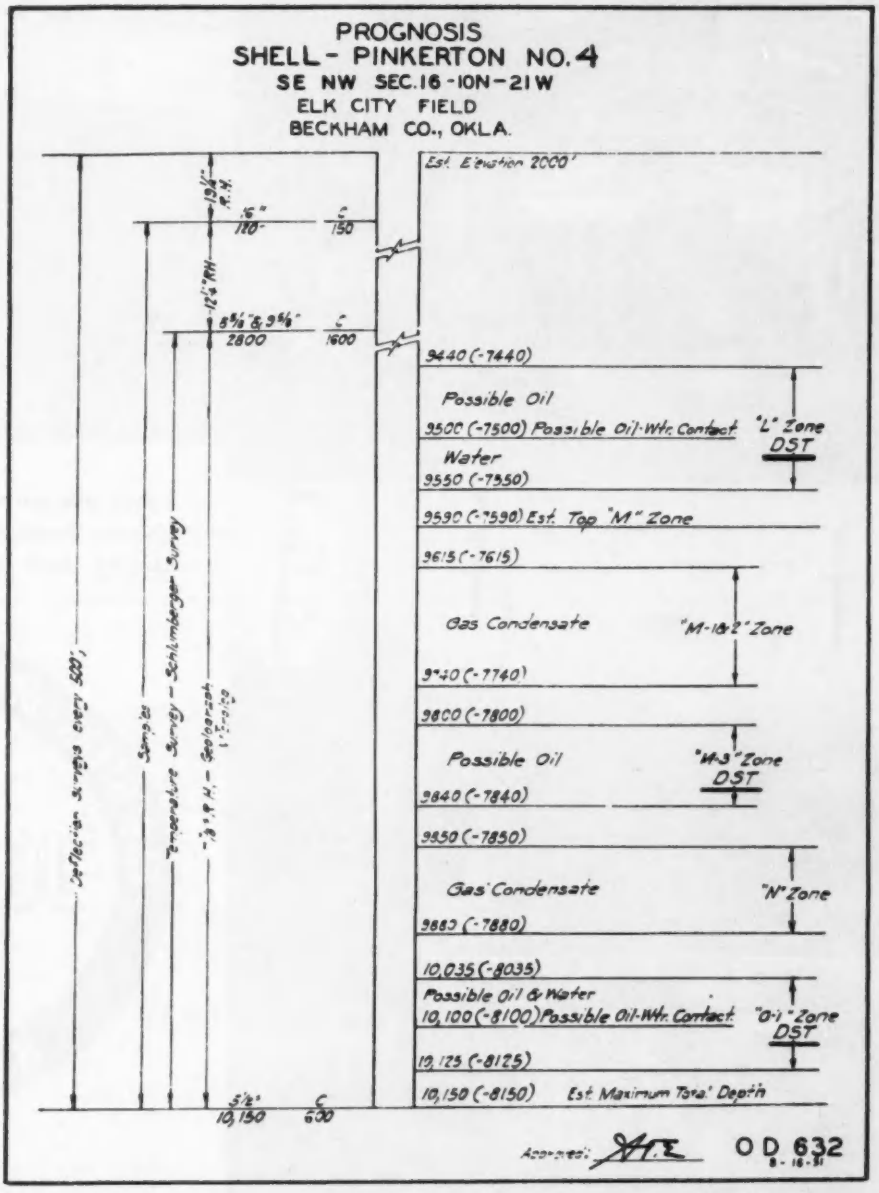


FIGURE 4—Sample well prognosis furnished the Elk City contractors by Shell. The contractors also received written sheets outlining Shell's requirements for mud, casing, testing, etc.

When the jet bit was put to the test on the company rig, an extra mud pump was utilized. All of the contractors were told of the experiment and invited to visit the rig as observers. The contractors were very much interested in the test, and made frequent trips to the well to check progress. Following the good results on this well, the jet bit soon became standard equipment for all Elk City wells.

Other reductions in drilling time resulted from familiarization with drilling conditions in the field, competition among the contractors, and the use of automatic bit weight controls. By February, 1951, these factors had trimmed rotating time from the 1250-hour average in 1949 to about 650 hours.

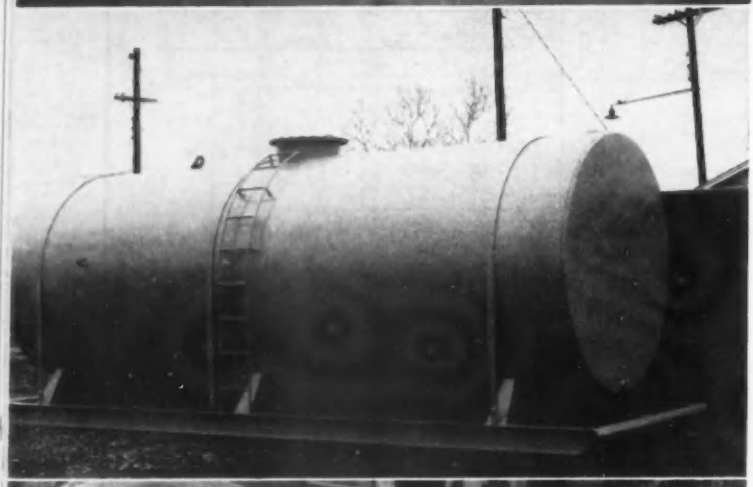
The cost curve. Savings in rotating time naturally resulted in lower costs in the contractor's operation. In turn, these reductions were passed on to the operator in the form of gradually decreasing footage and daywork rates. (See Table 1.)

By February, 1951, total well costs,

TABLE 1
Contract Prices at the Elk City Field

Contract Date	Footage Rate	Average Contract Depth on Footage Rate	Range of Daywork Rates (Plus Bits)
8-31-46	$17.00	12,500'	$750—$1050
8-17-48	10.00	10,500'	750*
9- 8-48	9.50	10,500'	700— 950
2-10-49	8.25	9,800'	700— 950
6-14-49	8.00	10,000'	700— 900
6-29-49	7.50	10,000'	700— 900
11-30-49	7.25	10,000'	650— 850
12-21-49	7.00	10,000'	650— 850
5-31-50	6.75**	10,000'	650— 850

* Plus 1½¢ per foot for drill pipe.
** This rate prevailed to the end of field development.



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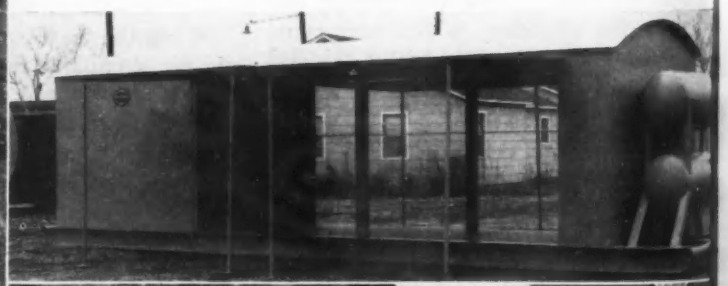


WELL SCHEDULE

4-27-53

LEASE	WELL NO.	PRODUCTION FOREMAN	EXPLOITATION ENGINEER	MECHANICAL ENGINEER	PROJECTED DEPTH	ESTIMATED INTERMED. CASING	ZONES TO DST	EST. CENT. & SCRATCH.	DRILLING CONTRACTOR	TOOL PUSHER
Carter & Caughron	1	Weber	Parkison	Reiter	15,500	3500	Tests	Undetermined	Big Chief	Stufflebeam
Counts	1	Oberlender	Lagrone	Moore	11,500	2700	Tests	Undetermined	Big Chief	Traugott
Gowdy	2	Weber	MacEachern	Reiter	10,300					
Hocker "C"	2	Weber	MacEachern	Reiter	10,300	3125	L, M, O-1	1025	Read. & Bates	Moss
Lindley	2	Weber	Barnes	Moore	10,350	3075	M	800	Falc.-Seab.	Necessary
Johnson "B"	3	Weber	Barnes	Reiter	10,250	3125	L, M, N	1000	Falc.-Seab.	Sublette
Fender "D"	4	Oberlender	Barnes	Moore	11,000	3000	M, N, Q	1250	Helm. & Payne	Wall
Blackmon-Hocker	1	Weber	Barnes	Moore	10,350	3125	M, N, P-1, Q	850	Big Chief	Weber
Blackmon-Woody	1	Weber	MacEachern	Reiter	10,900	3125	M, P, P-1, Q	1020	Falc.-Seab.	Knapp
Wingfield	3	Weber	Barnes	Reiter	10,250	3125	L, N	875	Rig #19	Wartick
Caughron "B"	1	Oberlender	MacEachern	Reiter	11,100	3150	M, N, Q	1200	Read. & Bates	Moss
Massey-Gregg	1	Weber	MacEachern	Reiter	10,300	3125	L, N	850	Helm. & Payne	Reed
Hocker-Woody	1	Weber	MacEachern	Reiter	10,300	3125	L, N	850	Read. & Bates	Moss

TENTATIVE DRILLING SCHEDULE
ELK CITY FIELD
MAY 19, 1952

Contractor	Present Well	Projected T. D.	Est. Date At T. D.	Next Well	A. F. E.	Recommended	Approved
Falcon Seaboard	*Evans No. 1	10,100	5-22	Fender "A" No. 2	x	x	x
Big Chief	McKenzie No. 4	10,100	6-2	Wann No. 4			
Big Chief	Fender "D" No. 2	10,300	6-14	Johnson "B" No. 1			
Falcon Seaboard	*Caughron No. 1	11,000	6-15	*Miller No. 3	x	x	
Reading & Bates	*Wingfield No. 1	10,250	6-16	*Evans No. 2	x	x	
Company Rig No. 19	Pyle No. 2	10,000	6-17	McKenzie No. 5			
Reading & Bates	Kinney No. 4	10,250	6-19	Jarrell No. 2			
Helmerich & Payne	*Summers No. 3	10,400	7-18	*Jay No. 1			
Helmerich & Payne	Hutton "B" No. 2	10,650	7-22	Rumberger No. 3			

* Partnership Wells

FIGURE 5—Contractors were able to keep abreast of Elk City field operations by means of these well schedules, which showed who was drilling where, and future locations.

(excluding tubing, production equipment and tankage) were cut to $127,000, despite a 25 percent commodity and labor price increase over the same period.

While costs continued to rise, most drilling expenses were further reduced, or at least held stable. However, the over-all costs of drilling were boosted, due to the critical shortage of casing which began in the spring of 1952. By 1953, the price of casing had more than doubled, and consumed more than 25 percent of the total cost of drilling (Figure 7).

The largest single item in drilling expense was, of course, the footage cost. Stabilizing this factor was a major contribution to lower total expenses.

Contract price on the discovery well was $17 a foot to 12,500 feet. The price dropped to $10 per foot to a depth of 10,500 feet in the second well, and later reductions came in 25- and 50-cent stages.

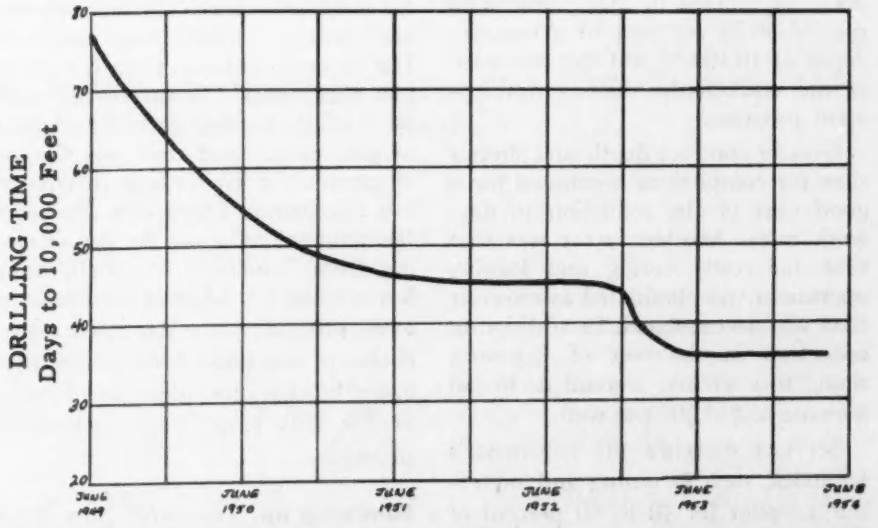


FIGURE 6—Drilling time at Elk City, based on 10,000 feet as a factor common to all wells, decreased steadily. Introduction of the jet bit at year-end, 1952, brought about a marked improvement in drilling time. From a 77-day average in June, 1949, drilling time decreased to about 35 days on the last well.

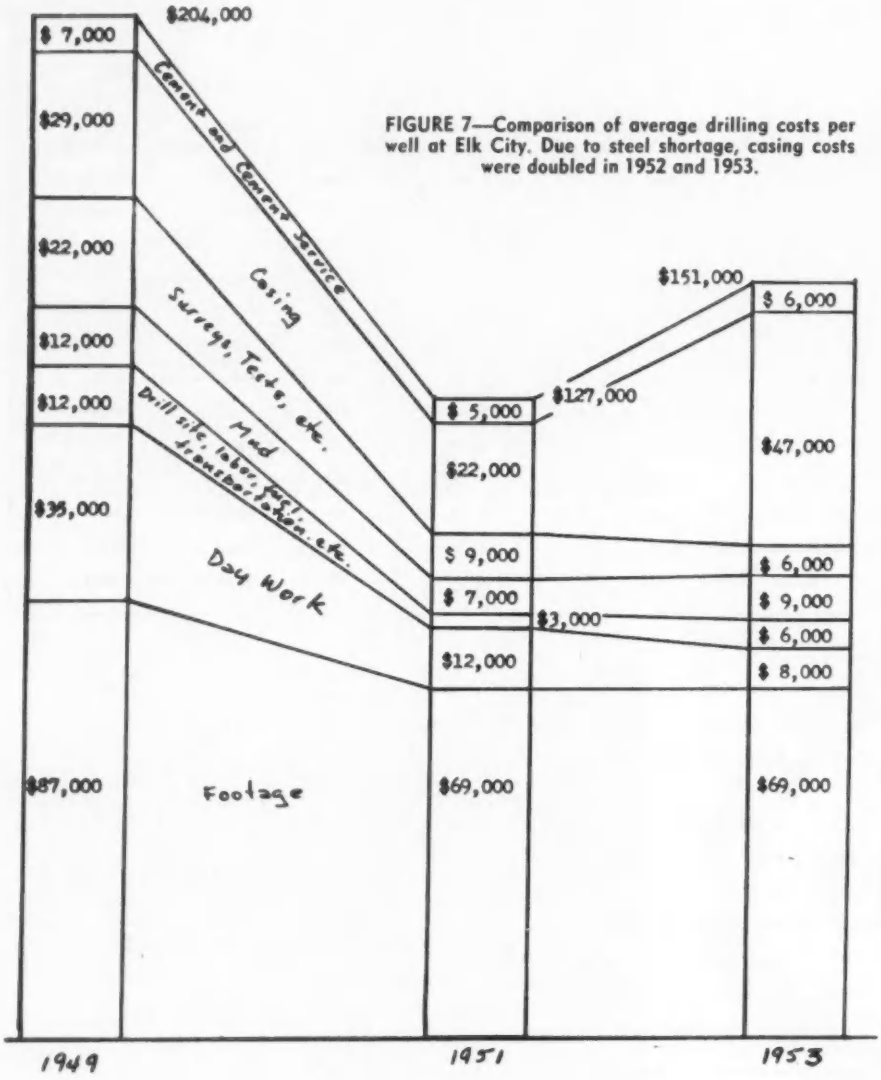


FIGURE 7—Comparison of average drilling costs per well at Elk City. Due to steel shortage, casing costs were doubled in 1952 and 1953.

Standardized drilling requirements throughout the field created an atmosphere in which Shell and the contractors were able to negotiate a field price for footage in May, 1950. The rate of $6.75 per foot to a contract depth of 10,100-10,300 feet prevailed to the end of the drilling development program.

Greater contract depth and shorter time for completions accounted for a good part of the reduction in day-work rates. Another factor was that time for costly coring and logging operations was eliminated as reservoir data was accumulated. In addition to reduction in the cost of day-work time, this saving amounted to an average of $13,000 per well.

Services outside the contractor's bailiwick, such as testing and surveying, account for 40 to 60 percent of the total cost of any drilling operation. A large part of the over-all reductions at Elk City were brought about by vigilance in chipping away at the costs of these items.

For example, economies were effected in mud costs by engineering for the least expensive, effective mud, and through a mud salvage program. Use of steel, instead of earthen, mud pits eliminated dilution of the mud by rainfall. Another procedure which helped reduce mud costs was the use of permanent type plugs to combat lost circulation. Other cost cuts were the result of reducing the size of casing from 7-inch to 5½-inch, using less cement, etc. Most of these savings were normal cost decreases that evolve in any large development program, but the most important benefits at Elk City came from cooperative planning.

Summing up. Teamwork proved the key to improved drilling efficiency and reduction of development costs in the Elk City field. Men and machines worked together to bring to a successful conclusion one of the major field development programs of recent years.

The true significance of this case history lies in the excellent relationship maintained between operator and contractors throughout the development program. Each side points to specific proofs of the benefits of planning ahead and cooperating to get the job done.

On the operator's part, most important was that Shell was able to complete a large drilling program in an orderly and economical manner. With an adequate number of responsible contractors with efficient tools on call, the company met deadlines for offset drilling on schedule. Considering the magnitude of the development, costs were pared to the lowest level consistent with efficient drilling.

"Pointing-with-pride" has become a post-Elk-City pasttime for the seven drilling contractors. In a day of economic pressure on the industry, they recall their Elk City days with pleasure. Each of the contractors interviewed reported a fair profit margin, even though the price-per-foot was appreciably reduced. Not the least benefit was the fact that the company paid drilling charges promptly.

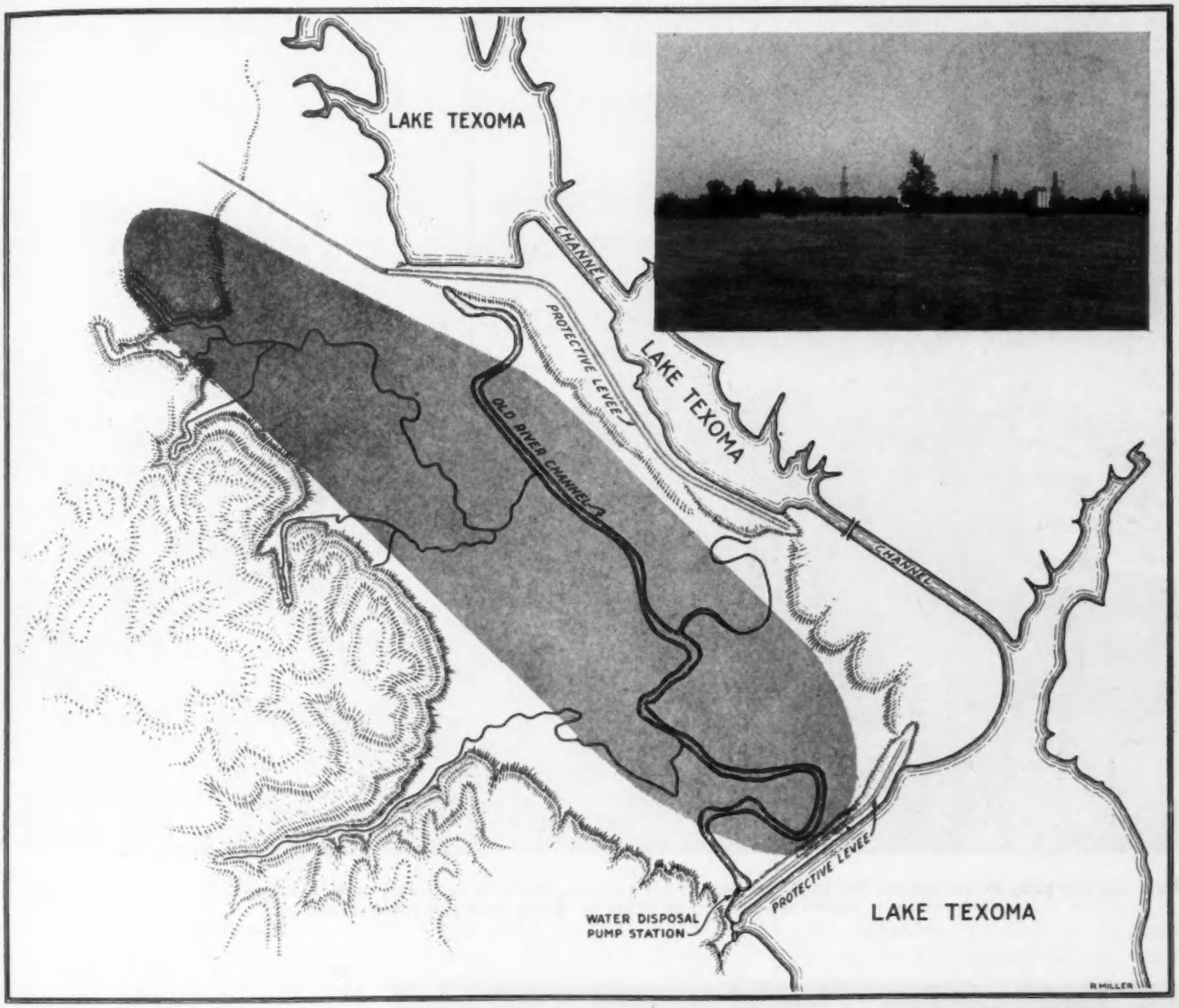
Continuity of work enabled the contractors to maintain efficient, skilled crewmen. Overhead costs were reduced by the elimination of wasteful down-time. Transportation costs were trimmed by being able to skid rigs from one location to the next.

The Elk City field stands as a notable example of a model field development program. Other companies, following similar plans, have also found the benefits of a coordinated program. They have learned that the operator can exercise considerable influence to reduce the contractor's expenses.

Careful planning offers one important answer to the problem of combating the rising costs of drilling. The routine set by Shell Oil Company at Elk City could well serve as a pattern for the economical development of many major fields.

ACKNOWLEDGMENTS

Research for this article was sponsored by the American Association of Oilwell Drilling Contractors. We are grateful for the generous assistance of Shell Oil Company in furnishing data. We are also indebted to the drilling contractors who made available the records of their work in the Elk City field development program.



Cumberland field, partially surrounded by protective levees, diversion channels and Lake Texoma was subjected to inundation prior to the installation of this protective system.

A Modern Ark Thwarts the Floods

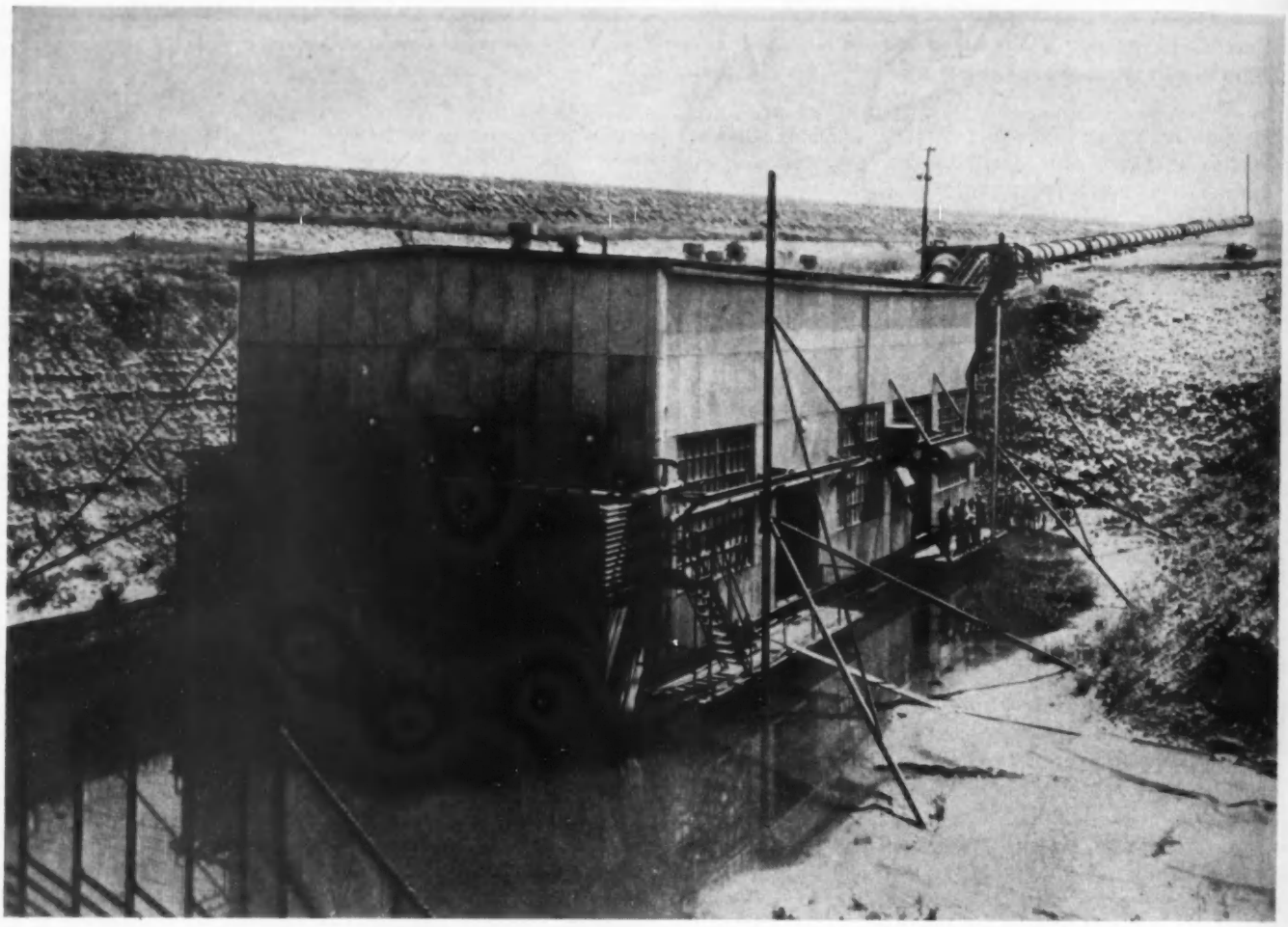
A floating pumping station constructed by The Pure Oil Company helps protect the Cumberland field from the devastation of floods.

By W. M. SAXON and J. R. WEYLER
The Pure Oil Company

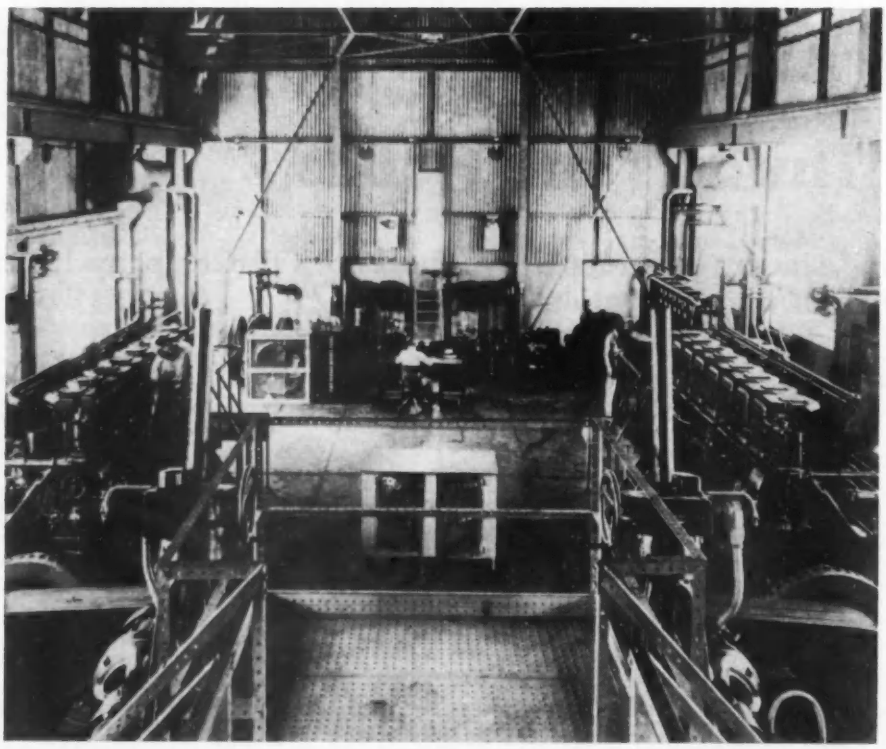
AN ELABORATE surface water disposal system, in operation in The Pure Oil Company's Cumberland field near Madill, Okla., removes as much as 85 million gallons of water daily from the old Washita River channel to allow normal dry-land operation of the field. This water is surface runoff from a 12½ square mile watershed which no longer can drain normally into the Washita River. The building of the Denison dam on the Red River south of Cumberland field created Lake Texoma, which itself would have flooded the field had not a system of protective levees been constructed. Wells in the field are as much as 35 feet below the lake surface.

The Washita River, which had run through the field, is diverted through a new channel with the levees and disposal plant providing normal field operation. The surface runoff water is sucked out of the old river channel, pumped through a 60-inch diameter penstock over the levee and finally discharged into Lake Texoma. The accompanying map shows the Cumberland oil field protective levees in detail.

The level of Lake Texoma is maintained at about 617 feet above sea level as compared to an elevation of the lowest producing well of 582 feet, and the level of the water in the



Barge mounted pump station and pit. The barge can float at any elevation, depending on level of isolated channel of Washita River. The transverse motion is limited to six inches by vertical steel pipe fender guides.



Interior view of the barge showing extension of engine shafts connected to pumps, with engines and circulating pumps and other auxiliary equipment in the background.

abandoned river channel is kept pumped down to an elevation of about 572 feet.

In the design and construction of the pumping station, Pure Oil assumed that existing storage in the isolated Washita River channel could be used to maximum capacity and that five inches of rainfall could be accumulated without inundation of the field. One inch of rainfall on the watershed draining into the abandoned section of the river channel amounts to approximately 217 million gallons of water. It was considered impractical to design a pump station which could pump at a rate equal to the maximum rate of rainfall, which explains one of the main reasons for mounting the pump station on a floating dock, constructed on a permanent cradle in a suction basin adjoining the river.

An interesting feature is the design of the discharge lines from the barge which not only carry water from the main pumps but are further utilized to support a walkway to permit access

to the barge. These pipes, which are 36 inches in diameter and 80 feet long, are secured to the 60-inch diameter penstock and to the discharge connections of the pumps by means of huge ball joints which are 60 inches in diameter at the ball, have a wall 2 inches thick, and weigh 8000 pounds each. These ball joints permit 22½ degrees of movement each way from the center line or will swing through a total angle of 45 degrees. Where the two 36-inch lines merge into the 60-inch line by means of a "Y" member made of reinforced steel plate and weighing approximately six tons, eight steel piles provide the anchorage for the penstock and the load of the "Y" structure and ball joints.

The discharge line consists of approximately 750 feet of 60-inch diameter pipe constructed of three-eighth inch plate with an angle stiffening ring welded on at 12-foot intervals. The penstock is carried on 55 supporting piers, each equipped with semicircular saddles to permit the pipe to move with temperature changes. The line is split into two segments, one 500 feet long anchored at both ends with a central expansion joint, and the other segment 250 feet long similarly constructed. The line has one 75-degree turn in a horizontal plane and one 45-degree turn in a vertical plane at the point where it plunges 40 feet into a stilling basin of 15,000 barrels capacity. The final discharge into Lake Texoma is through a 10-foot wide by 5-foot high concrete spillway.

Construction of the barge began by the preparation of a basin 100 feet long by 50 feet wide with a bottom elevation of 560 feet above sea level. In this basin a cradle five feet high made up of concrete piers capped with 14-inch by 16-inch wood beams was constructed to serve as a permanent barge cradle. The barge was erected upon this cradle which serves as its dry dock whenever inspection or repairs are necessary. Dry docking for inspection purposes is performed at least once every five years. Surrounding the barge pit is a construction bench 20 feet wide at an elevation of 570 feet. This construction bench was used for trucks and storage of materials and equipment during the building operations. Approximately 30,000 cubic yards of earth and some stone were moved to make the basin, which was protected from river channel high water by a temporary levee raised to an elevation of 595 feet.

The floating dock which carries the pumping equipment is 85 feet long, 45 feet wide, and covered with a building which is 25 feet high. The dock draws about five feet of water. The hull of the dock is rectangular in shape and the space below the deck is divided into more than 60 water-tight compartments formed by welded steel plate construction to stiffen the hull and provide support for equipment. Some of the compartments are used for the storage of lubricating oil and water; others are used as ballast tanks to maintain trim.

Two main units consist of 30-inch discharge by 36-inch intake centrifugal pumps direct connected to vertical gas engines which have a rating of 600 horsepower at 400 revolutions per minute. Belted to the main drive shaft of each engine is a 900 rpm, 100 KVA, 3-phase, 440/220 volt generator which supplies electric current to the switchboard for operating the auxiliaries. A third 100 KVA generator direct connected to a multiple cylinder gas engine provides electricity for standby service and for starting, while a fourth 25 KW generator direct connected to a small gas engine furnishes electricity for lighting and the operation of small tools when none of the main generators is operating. Two 6-inch centrifugal pumps powered by 30-horsepower electric motors circulate rain water through a closed cooling system made up of cast iron sections over which nozzles direct a spray of river water pumped by two 5-inch centrifugal units powered by 15-hp electric motors.

Make-up water to the spray system, furnished by two pumps mounted on a side fender, is pumped through a five-foot gravel filter before being introduced into the spray system. Gland water to the stuffing boxes of the main pumps is furnished by two 1½-inch centrifugal pumps, with the water passing through a filter for final cleaning. Priming of the main pumps is accomplished by two centrifugal vacuum pumps powered by 10-hp electric motors with a 15-hp gasoline engine for standby service. Air compressors for starting consist of one electric-driven and one gasoline-driven two-stage units. Interior lighting is such as to minimize shadows within the building, and the exterior is floodlighted for further illumination and safety.

The minimum combined capacity of the pumps, when operating at low levels, is approximately 75 million gallons of water daily or about 7000 cubic feet per minute against a total dynamic head of 25 pounds per square inch. At this rate the pumps are handling 436,800 pounds of water each minute. The capacity of the pumps increases with a rise of water in the storage basin. The capacity of the station can be better visualized when attention is directed to the fact that average water consumption of a city of 750,000 population is no more than the minimum pump capacity of the disposal plant.

The penstock has been designed as

About the Authors

Weyler

Saxon

J. R. WEYLER was graduated by the Colorado School of Mines in 1950 with a degree in petroleum engineering. That same year he joined The Pure Oil Company as a roustabout in Oklahoma. He was later that year transferred to Wyoming as a production engineer. At the present time he is assistant chief division production engineer for Pure's Southwestern Producing division.

•

W. M. SAXON is a graduate in mechanical engineering from the University of Kansas, at Lawrence, Kansas. He was associated with the Gypsy Oil Company from 1927 until 1935 when he joined The Pure Oil Company as assistant chief production engineer. He has held various assignments with Pure, including chief division production engineer at Tulsa and is now division manager of their Eastern Producing division.

The Pure Oil Company's office, warehouse and pipe yard in the Cumberland field.

to size and profile on the discharge end to utilize the maximum siphon effect which amounts to 18 inches of mercury. In addition, full efficiency is obtained by the use of a small vacuum pump connected to the high point of the penstock where a vacuum of 26 inches of mercury is maintained. If this effect were not utilized, 50 percent more horsepower would be required. The 36-inch lines and the 60-inch penstock are cathodically protected by hanging 2½-inch tubing and 4½-inch drill pipe respectively in the lines and providing a potential by means of rectifiers. The bottom of the barge is also cathodically protected. Corrosion of integral components has thus been kept at a minimum.

The size of the various units in the station is dwarfed by the magnitude of the plant. The main centrifugal pumps stand 10 feet 3 inches high from the flange of the pump suction to the top of the impeller house and each weighs 27,600 pounds. Each engine weighs 53,000 pounds. The 36-inch power operated gate valves stand more than 12 feet high and each weighs almost 10,000 pounds.

An operating record is maintained on the performance of the engines and pumps. The record shows the gallons pumped, inches of current rainfall, elevation of water in the storage channel, gallons of lubricating oil added to each engine, hours of operation since engine oil changes, and total hours of operation since a major overhaul. Observations of temperatures and pressures of the cooling water and lubricating oil to and from the engine are recorded. Exhaust temperatures from each cylinder are also checked and recorded. The annual inspection covers checks for alignment of centrifugal pumps and engines, removing a cylinder head to inspect the valves, removing a piston to check the condition of the rings and "mike" for cylinder wear. Main bearings, connecting rod bearings, lubricating system and cooler, and governors all require inspection and check.

Since the station has been in operation, more than 22 billion gallons of water have been pumped and the two pumps have operated a combined total of over 12,400 hours. Figure 1 shows a record of water pumped by years for the period to January 1, 1956. In connection with the operation of the station, it is interesting to note that during the maximum pumping year, 1946, the pumps operated 25 percent of the time while only pumping 5 percent of 1955. The pumps have operated 13 percent of the time since completion of the station as compared to a preliminary estimate of operating time set at 20 percent. A study of the rainfall and the quantity of water pumped indicates that the "run-off" during wet seasons approaches 65 percent for a maximum, and during the dry seasons the "run-off" may be as low as 5 percent. During February of 1945, a three-and-one-half inch rainfall, which followed several days of rainy weather, raised the water level in the river channel to 581.4 feet and required five days of continuous pumping to bring the level down to 573 feet. This is the highest level that the water in the river channel has reached even though there have been three other three-and-one-half inch rainfalls. These occurred when the ground was not previously wetted and the "run-off" was substantially less. No unusual troubles have thus far been experienced in the operation of the station. —**The End**

Dual three-foot diameter discharge lines connect the pumps on the barge to the five-foot diameter line at the top of the slope permit free vertical movement of the barge with changing level of water.

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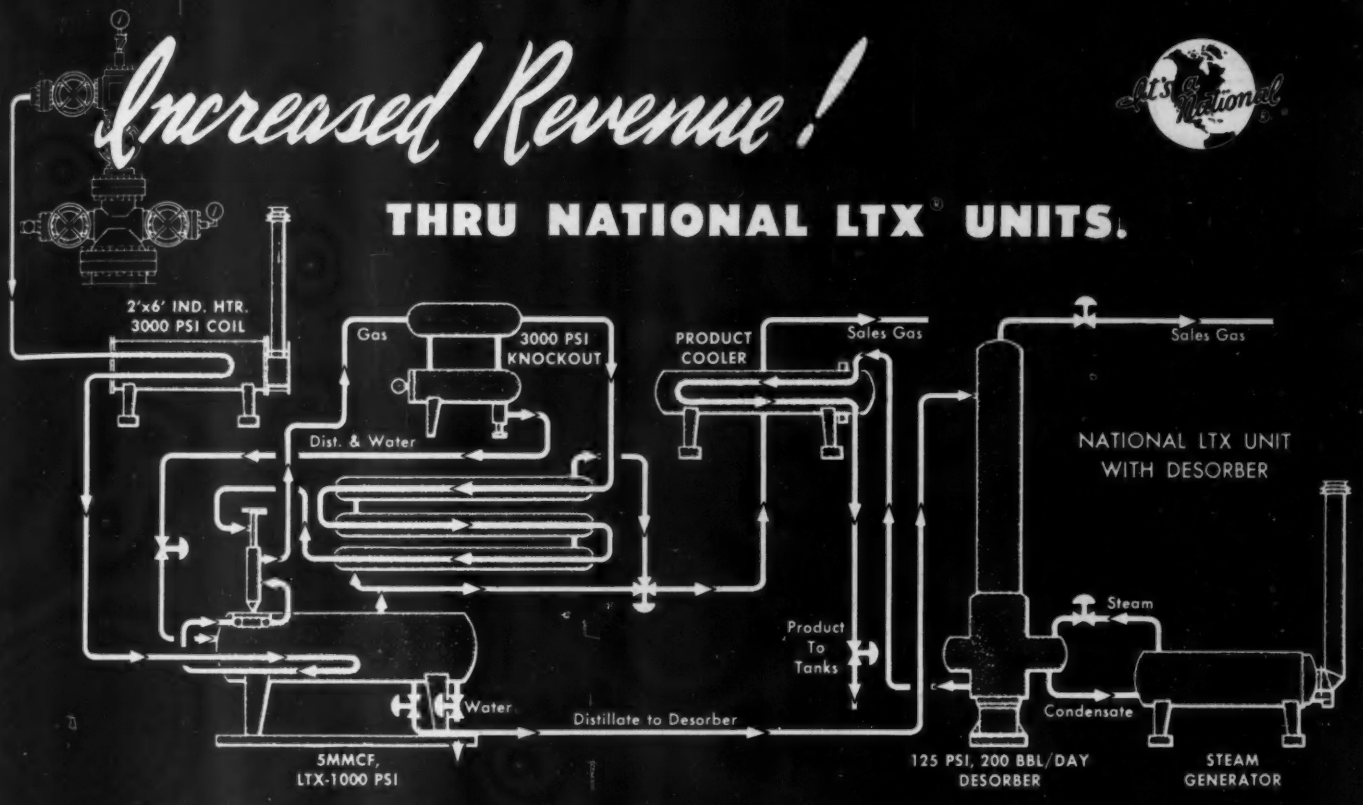

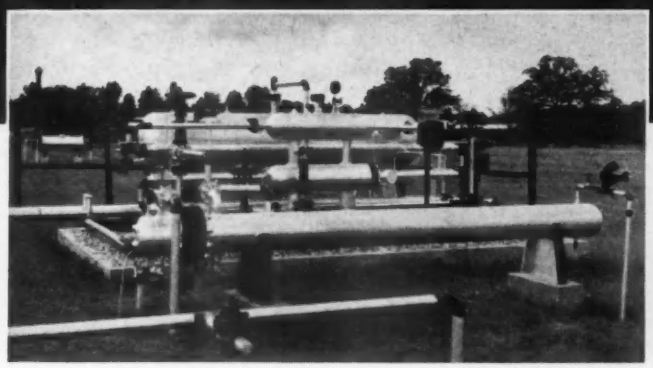

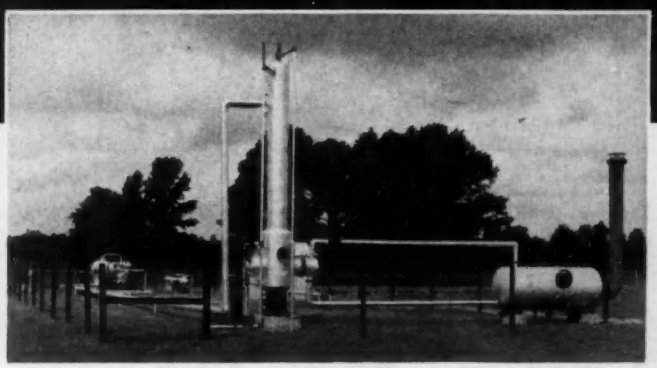

Installation of a National LTX Unit with desorber on this gas distillate well near Shreveport, Louisiana, INCREASED the recovery 14 barrels of stock tank liquid per MMCF of sales gas produced.* The well originally tested 70 barrels per MMCF with conventional separation equipment and increased to 84 barrels per MMCF of sales gas produced after the installation of LTX equipment. The LTX unit operates at approximately 300 psi and 5°F. Flowing pressure is approximately 2500 psi.

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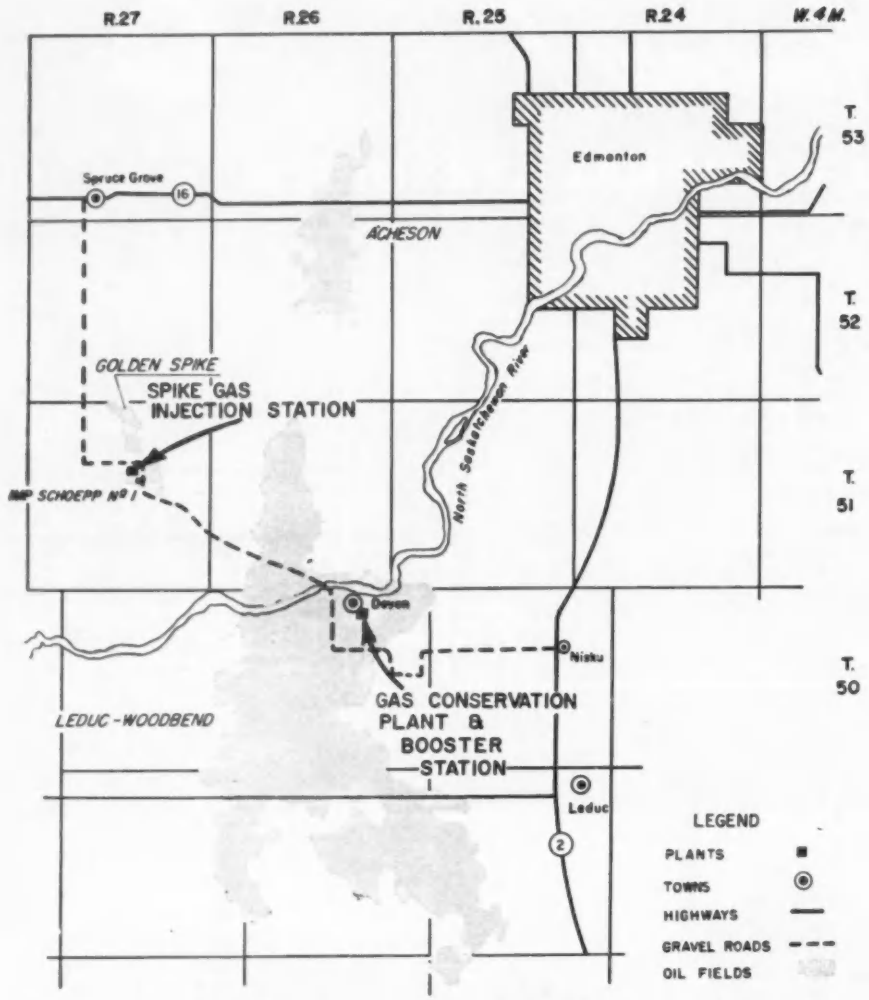


This map of the Edmonton area shows location of Spike gas injection and booster stations.

Pressure Maintenance In the Golden Spike Pool

Pressure maintenance is being given more and more consideration as a means of obtaining maximum recovery at minimum cost. Here is a case in its favor.

By D. J. McEACHERN, Imperial Oil Limited
Edmonton, Alberta, Canada

PRESSURE MAINTENANCE by gas injection is solving the problem of rapidly declining reservoir pressures in the Golden Spike pool operated by Imperial Oil Limited. The declining pressure and the prospect of reduced production rates prompted the investigation and installation of a pressure maintenance system in this prolific Central Alberta field.

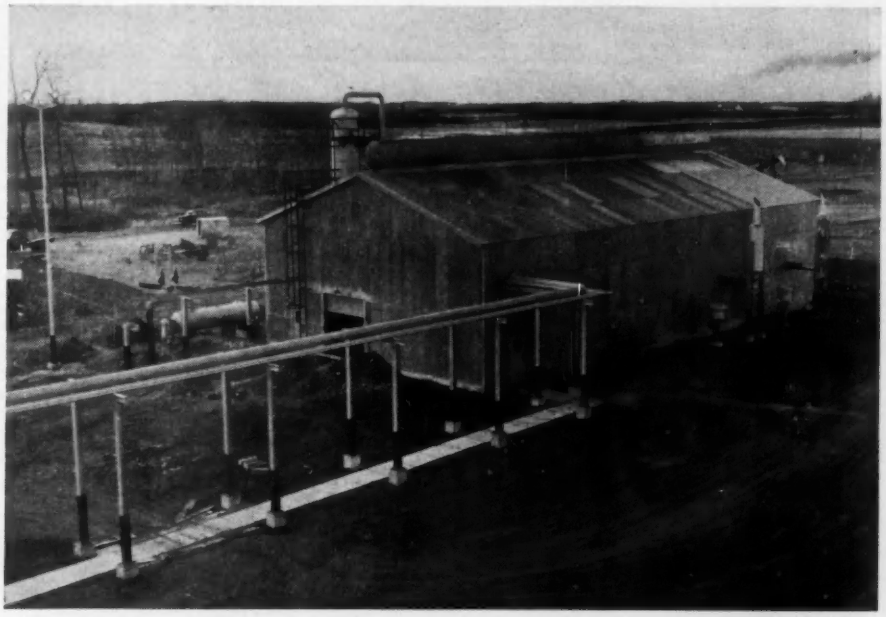
The scheme has been successful. The methods of conservation and pressure maintenance used will influence practices in areas with similar problems.

The field is some 25 miles southwest of Edmonton, Alberta, Canada. The accompanying map gives the pool's location in respect to other known landmarks. The Golden Spike oil field was discovered by the drilling of Imperial Schoepp 1. This well was drilled to 5807 feet and was completed with a pay section of 545 feet in the D-3 (Leduc) formation of the Upper Devonian. The well was completed open-hole on April 18, 1949, at an initial potential of 7320 barrels per day, the oil having a gravity of 36 API and an estimated gas/oil ratio of 500 cubic feet per barrel. Development drilling proved up seven producing wells on 160-acre spacing. The estimated producing area is 1116 acres with an average thickness of 520 feet. The porosity of the formation is 9.16 percent and the connate water is approximately 20 percent. The field is unitized, allowing the production to be taken on a field basis rather than a well basis.

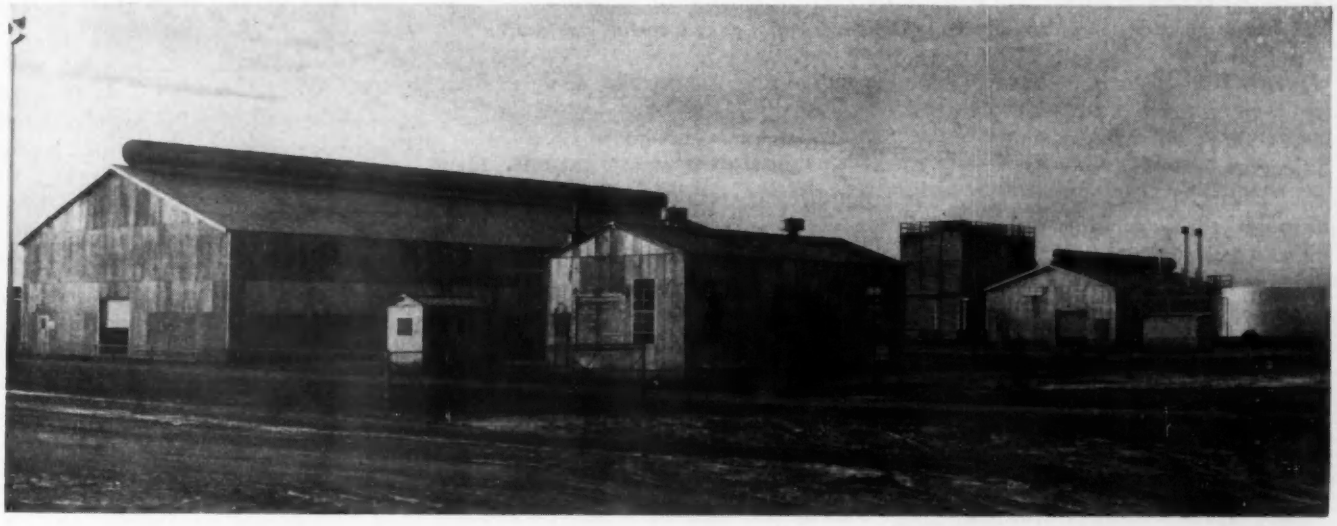
The reservoir contains under-saturated crude with a bubble point of 1390 pounds per square inch gage and no gas-cap or underlying water leg. The original recovery mechanism was the expansion of undersaturated crude oil. The discovery reservoir pressure of 2095 psig steadily decreased with production and, at the crest of the structure, the bubble point was reached in February, 1954. During the winter of 1952-53, a gas lift installation was constructed to maintain flowing production from the wells.

In order to maintain high flowing production rates and to increase the ultimate recovery of the field, it was decided to increase the reservoir pressure. Following a study of alternatives, the injection of natural gas was selected because its efficiency is equal to, or greater than, water injection in this particular field and allows the use of new reservoir recovery methods that may be developed. It was estimated that sufficient quantities of gas would have to be injected into the reservoir to increase the pressure to

At right is a view of the Spike Gas Booster Station at Devon. Here the gas is compressed, scrubbed and dehydrated before transmission to Golden Spike. Notice the overhead utility lines from the Leduc Gas Conservation Plant No. 1. The buildings contain no windows except in the main doors. Roll type louver on the ridge controls flow of air for heating and ventilating.



From left to right below is the compressor building, meter house and compressor building for the gas-lift installation, cooling tower, boilerhouse, fire cart house and 2000-barrel water storage tank at the Spike gas injection station. The water tank is not insulated but is heated by steam to prevent freezing. Steam, air and fuel gas are carried overhead on pipe stanchions.



1600 psig in order to restore the productivity of the pool.

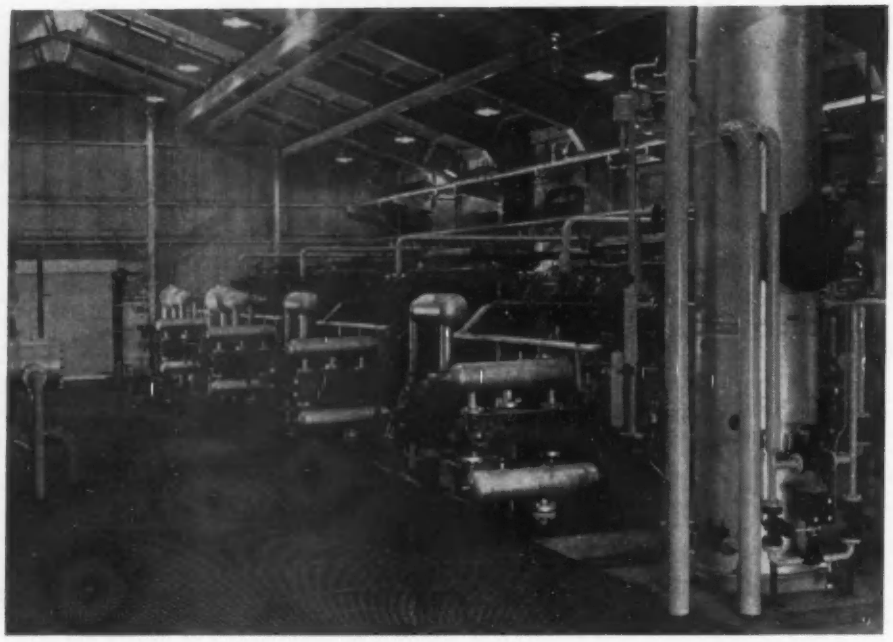
Gas Supply. The solution gas produced with the crude oil in this pool had to be supplemented with gas from five other sources. A gas supply of 20 million cubic feet per day is required to operate the plant at its design capacity. A maximum of 10 million cubic feet per day is available from the Leduc-Woodbend oil field, which is located some 10 miles from Golden Spike. Gas surplus to the requirements of the Leduc Gas Conservation Plant No. 1, located in Devon, is compressed in a booster station and sent to Golden Spike. The gas is obtained from a gas gathering system operated by The Devonian Natural Gas Company. The booster station compresses the gas from 40 to 500 psig and removes all the hydrogen sulphide and water before transmission. Processed gas from the Leduc Gas Conservation Plant No. 1 surplus to market requirements may also be transmitted through the same line to Golden Spike. This system effects the maximum conservation of gas in the Leduc-Woodbend field.

The Viking, Basal Blairmore and D-1 zones at Golden Spike contain gas and are used as sources of high pressure gas. The Basal Blairmore and D-1 streams contain hydrogen sulphide, which is removed by a scrubbing unit at Golden Spike. Many combinations of these various gas supplies can be used to make up the gas volume required for injection.

Gas Flow. The low pressure solution gas from the adjacent production battery is compressed in three stages from 50 psig to injection pressure. The gas

About the Author

D. J. McEACHERN is division civil engineer for Imperial Oil Limited, Producing department, Edmonton, Alberta, Canada. He was born in Alberta and studied chemical engineering at the University of Alberta at Edmonton. Since joining Imperial in 1948, he has been associated with oil field construction, gasoline plants and compressor stations.



An interior view of the compressor building shows the compressors, interstage scrubbers and heat exchangers. Notice the absence of overhead piping by using a central pipe trench.

streams from Devon and the Viking zone enter the plant at 350 psig and are compressed in two stages before injection. The sour gas streams from the Basal Blairmore and D-1 pass through the scrubbing unit at 620 psig. All the streams are combined at this pressure and are dried by a glycol type dehydrator before the final stage of compression. The gas is cooled after each stage of compression by heat exchangers and any liquid hydrocarbon condensate that is formed is transmitted to the Devon plant for processing.

The volume of gas metered into the injection well is balanced with the total of each gas stream less the fuel gas and liquid product equivalent.

Plant Design and Equipment. The compressor stations are designed with central pipe trenches running the length of the buildings. All compressor suction and discharge valves, headers, gas flow controllers and meters are located in the trench. This type of construction permits the housing of all equipment and still maintains the required clear floor area for maintenance. The buildings are of a rigid steel frame type covered with corrugated sheet metal. Steam is used in heating-ventilating units, for heating the building.

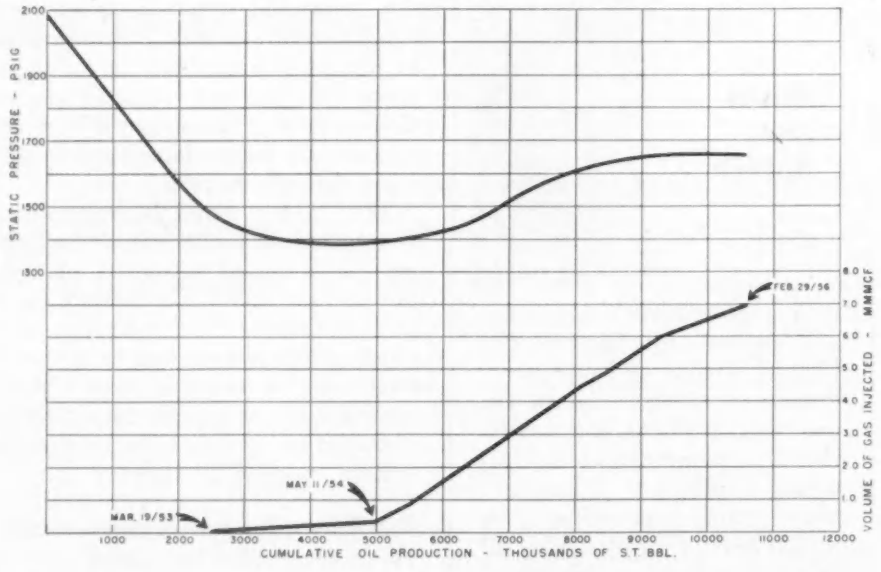
The plants utilize 660-horsepower 2-cycle angle type gas-driven compressors, there are 2 in the booster station and 4 in the injection station. The engines are equipped with normal safety shut-down devices to protect them. The heat exchange equipment is the standard shell and tube type. The gas coolers use water from an induced draft cooling tower designed to cool 1925 gallons per minute from 98 to 60° F. Circulating water pumps are all horizontally split case centrifugal pumps for ease of maintenance.

Utilities. The booster station at Devon obtains all its utilities from the Leduc Gas Conservation Plant No. 1. Steam, cooling water, compressed air, monoethanolamine and di-ethylene glycol are supplied to assist in the compression and processing of the gas.

The boiler house at Golden Spike supplies steam, tri-ethylene, glycol and cooling water for the injection station. The two boilers supply steam at 19 psig for heating. Utility water pumps and a standby fire water pump in the boiler house are also in the boiler house. Water is obtained for the plant from water wells located on the banks of the North Saskatchewan river. The water is pumped six miles through a 4-inch line into a 2000-barrel storage tank beside the boiler house.

Reservoir Performance. The reservoir pressure and volume of gas injected have both been plotted against cumulative oil production. The reservoir pressure steadily decreased from the time of discovery until some 2 million barrels of stock tank oil was produced. Until 5 million barrels had been produced, the pressure was still dropping but at a decreasing rate, due to the small scale injection of gas and possibly some solution gas being released at the crest of the structure. The large injection system was put into operation on May 11, 1954, and, since that time, the reservoir pressure has increased. The reservoir pressure is now 1650 psig and it is planned to maintain, or increase, this figure. The pool is capable of producing 35,000 barrels per day with a subsurface drawdown of less than 100 psi.

Pressure maintenance by gas injection has restored the subsurface pressure to where flowing production of the pool is assured. —**The End**



Rapid decline of the static pressure was reduced, stopped and built up again as the pressure maintenance program took effect. Its effect on production is shown clearly also.

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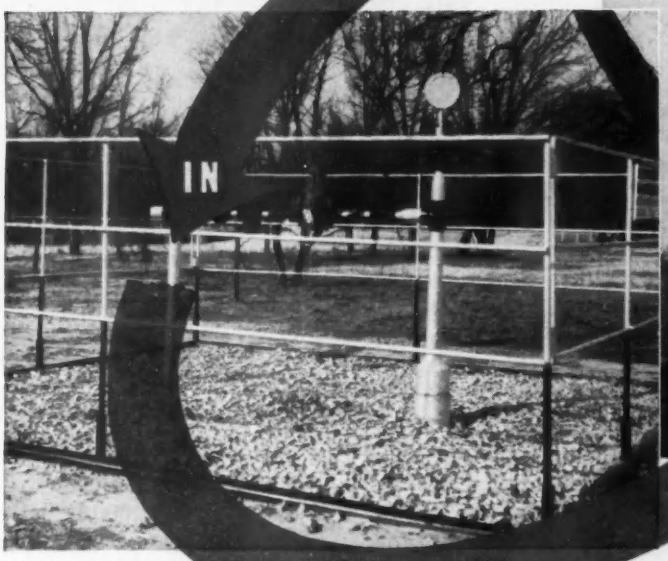
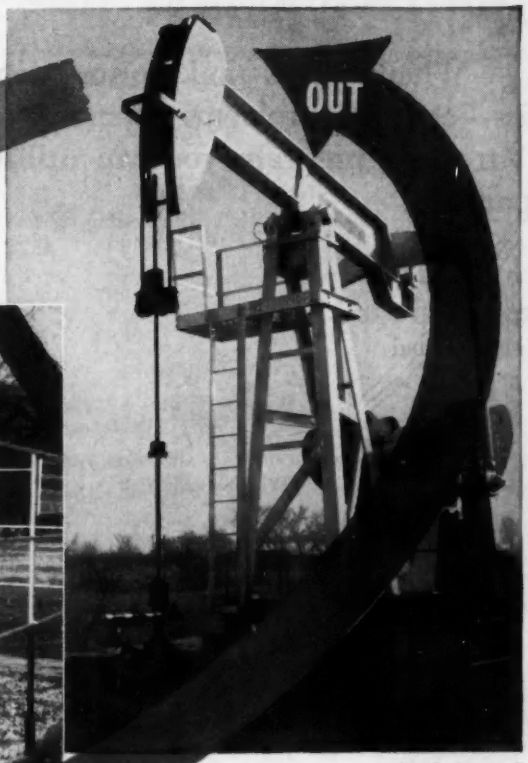


Water injection well



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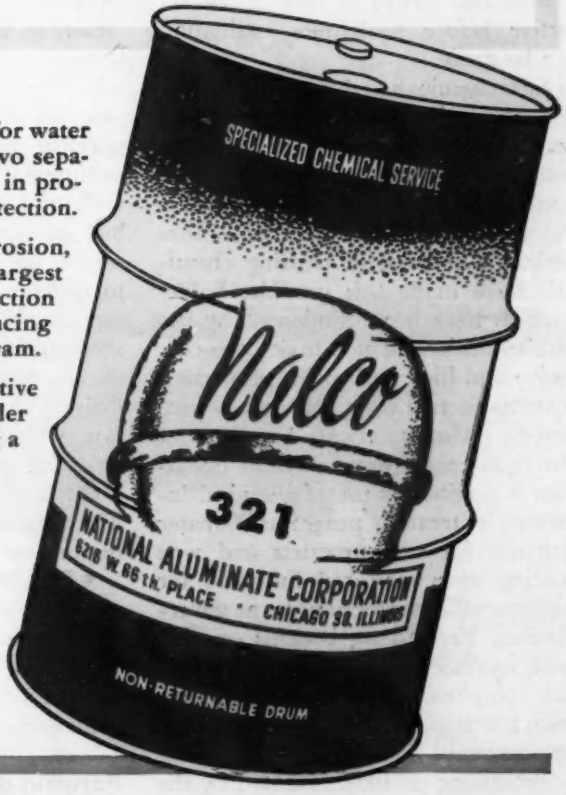

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Why Not Dissolve Your Paraffin Problem?

Whether it is tank bottom control—flow line difficulties—or well problems—there is an economical chemical treating program you can utilize to effectively control paraffin.

By BUFORD CRANFORD
BrakeSol Incorporated
Oklahoma City

TREATING OF PARAFFIN with chemicals is the safest and most efficient method of controlling this problem in the production of oil. The success of a treating program is dependent on making a complete survey of the problem, then choosing the correct method of application. The success of the program can further be assured by using the services of trained field representatives of the chemical companies for the purpose of setting up the proper program.

In any type of paraffin treating program it must be kept in mind that the program must be carried on for a sufficient length of time to be effective before a definite evaluation can be made.

New chemicals and improved methods of application have paved the way for better control of an old problem, "paraffin or wax." The trends in application are from corrective treating to preventive treating. Suspension additives in paraffin treating chemicals have made this possible. Safety hazards have been eliminated by use of chemicals with non-toxic, non-corrosive and high flash point properties. Systematic treating programs reduce cost by giving maximum benefit from chemical used. More efficient operation is possible by use of chemical injectors in treating programs. Greater demand for wax products and wax coating have increased the need for high paraffin content crudes at the refineries. Preceding benefits coupled with increased field service by chemical companies and suppliers give a resource that has not been available in past years.

Producing problems created by the deposition of "paraffin" in the production system exist in the majority of the world's oil fields. The particular problems created by the paraffin deposit or its degree of severity will vary and be common to certain areas of similar conditions. Due to this characteristic of the problem, it is necessary that the treating programs be flexible and adapted to the particular condition. Before such a program is designed a complete survey of the problem should be made.

Survey of Problem. As with other problems the oil industry has faced, it is necessary to know the problem. In many cases we have developed a "learn to live with it" attitude. This is understandable but does not help solve the problem. Information available on the particular well or lease paraffin condition is too often incomplete and vague. Past histories on wells and leases are difficult to secure but checks should be made prior to setting up the treating program. Due to differences in individual wells, records should be kept on each for a short period of time, or until a trend or character of the well problem is defined. A particular paraffin condition will generally hold true for all wells on a given lease, but very seldom for all wells in the pool or field. The following factors are of primary importance in a survey:

- Paraffin drop out point.
- Rate of accumulation.
- Consistency of the deposit.

As these terms will be used through out the article, the following is a brief explanation of each:

Paraffin drop out point may be defined as the point of separation of the paraffin from the crude oil. This point is usually a few feet up stream from the actual deposition. There are several factors that contribute to this separation but are primarily due to changes in temperature and pressure. This point may occur any place in the producing system, from the time the oil enters the well bore until it is processed at the refinery. There may be one or more drop out points in each producing system. Location of drop out points is important in setting up preventive treating programs to determine place of chemical injection.

Rate of accumulation or the speed with which the paraffin deposits form, determines the severity of the problem. The rate of accumulation may be faster at one drop out point than at others or a relatively even build-up from the first drop out point through the rest of the system may occur. It should be pointed out that surface temperatures effect the rate of accumulation to a varied degree, depending on the drop out point and causes of separation. It has no effect on a down-hole problem. There is a retarding of build-up, in some fields, in flow line and tank bottom problems during periods of high surface temperature. This is more often a pitfall than an asset. Even though the build up has been retarded, accumulation is still occuring. Treating programs in such cases should only be altered, not discontinued. This will keep the problem from getting out of hand at the first seasonal drop in temperature.

Consistency of the paraffin is subject to changes from its state at the time of deposition. The presence of gas, water, and deposits of foreign materials all increase the severity of the problem even after the paraffin build-up has occured. Gas passing over the deposit pulls the light ends out of the paraffin causing a drying effect. Water contact, unless at high temperatures, tends to set up the paraffin into a more plastic state. After a deposit has begun to form it is an ideal spot for other oil well residues to collect. Among those resi-

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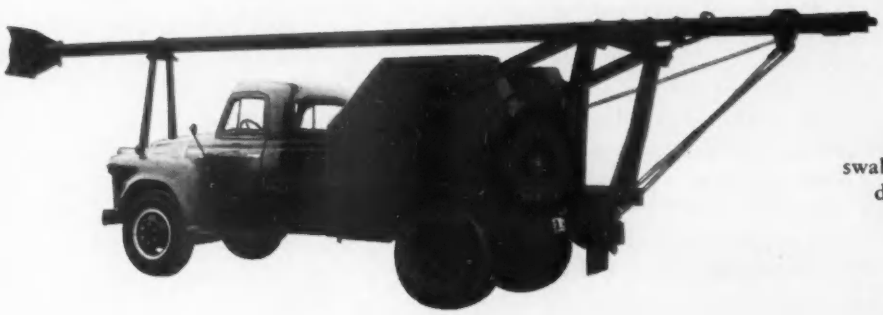

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dues found in paraffin deposits are, calcite, crystals of sodium chloride, calcium and barium sulphate, oxides of iron, carbonates of iron, calcium and magnesium. By dissolving or preventing paraffin build-up, these materials are allowed to continue in the flow and settle out in the tanks. The color of the paraffin or wax is not a true gauge of its consistency. Colors range from black, brown, yellow to white, and any combinations thereof.

Suitable surveys can be conducted with equipment commonly used for other purposes. In order to capitalize on this fact, it is necessary to provide space or make notations on reports used for these other purposes. The procedures and methods of assembling the information will differ, but the following check points are offered. A regular pressure gauge is one of the most common to apply to flow line problems. All lines should be checked to determine normal pressures. Periodic readings on pressure will assist in determining the rate of build-up. In running any type of wire line tools, pressure bombs, temperature surveys, etc., a definite check can be made on drop out points and rate of accumulation in tubing of flowing wells. A thorough check during tubing and rod jobs can give much desired information. Grind outs of the oil at the well head and stock tanks will give some indication of increases or decreases in paraffin drop out. Power oil, stock and storage tanks should be thiefed periodically to determine rate of bottom build-up and consistency of the bottom. By checking chokes, bull plugs, unions, and other connections a more complete picture can be made. If mechanical methods of removal are being used, records of operation time and pressures used can be sources of information to check the nature of the problem.

Preventive Treating. Crude oils vary as to "paraffin" content, but oils with the higher content are not always the most severe problem. A particular oil in natural form will hold its "paraffin" in solution under certain temperature and pressure. It only becomes a problem when the conditions change, and a drop out occurs. It would not be possible to produce the oil without changes in these conditions. One solution to the problem is to increase the crude oils capacity to hold more paraffin in solution.

By introducing the chemical into the stream ahead of the drop out point the chemical will keep the paraffin in suspension in the oil and completely eliminate deposition throughout the entire system from the well bore to the refinery. Where multiple treating problems exist combinations and mixtures of corrosion inhibitors, water emulsion compounds, and paraffin treating chemicals can be used.

Preventive treating holds many advantages over the "slug" or "batch" type treating. The most important being the prevention or the control of the paraffin before it becomes a problem. Paraffin deposits that are allowed to build up cause a decrease in the efficiency of practically all equipment used to produce the well, including dump valves, treaters and separators, meters, automatic switchers, etc. Treating temperature can be lowered by use of a paraffin treating chemical thus increasing gravity and volume. This is of concern to the equipment manufacturer as well as to the producer. In this type of treating no loss of production is experienced due to downtime, or loss due to period of restriction before critical plugging occurs.

Other benefits will accrue in a preventive program, through the use of chemical injectors. Company personnel can utilize their time by filling pump reservoirs on regular rounds of checking wells instead of having to make special trips. There is an elimination of chemical waste by less handling and by direct input.

The biggest benefit that is realized through the use of a chemical injector is that an even and controlled injection rate is maintained. This is very necessary in a preventive program. In the Glenrock area of Wyoming a paraffin condition in flow lines was aggrevated by the lines being layed in irrigated farm land with creek crossings. Lines "A" and "B" were steamed two weeks prior to the start of treatment. Normal pressure on both lines was 40 pounds per square inch. Line "A" had already built up to 55 psi and line "B" to 45 psi. Paraffin treating chemical was injected at each well head by means of a chemical pump. Daily production of well "A" was 200 barrels and on well "B" 240 barrels. Injection rate was set at three quarts per day. Within five days both pressures dropped to normal and remained so up until the last report which covered a 90-day period.

A paraffin treating chemical and water emulsion chemical combination is being used in one area of Mexico to control build-up in a 12-inch transmission line. This line is 100 miles long. A mixture of one part paraffin treating chemical to one part water emulsion chemical is being injected at the pump station in the field. The rate of injection is 55 gallons of mixture per 10,000 barrels of production. Without this treatment the line would plug in ninety days.

Regulative Treating. Regulative treating is simply systematic "slug" or batch treating. It most generally has its applications under conditions of slow rates of accumulation. In some cases this type of treating is necessary to clean up a system before continuous treating is started. It should be remembered that at the start of any program, not only the paraffin content in the daily production is being treated but also that which has built up prior to the start of treatment.

In some cases, due to methods of producing the well, such as one with a packer set in the casing, we are unable to inject the chemical ahead of

About the Author

BUFORD CRANFORD is chief treating engineer for BrakeSol, Inc., Oklahoma City. He attended Oklahoma A. & M. School of Technology and joined BrakeSol as a treating engineer shortly after his graduation in 1950. Since that time he has worked on paraffin problems in Central Mid-Continent, Rocky Mountain and Canadian oil fields. He is now supervisor of all BrakeSol treating engineers.

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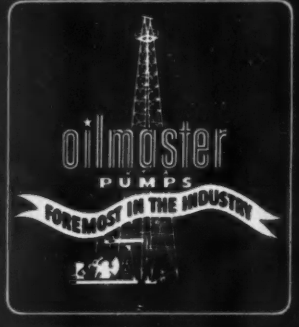

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the drop-out point. This is another condition for regulative treating.

The program must be regular in order to keep the build-up from getting out of hand and causing a plug off. Frequency of treating is the key to most regulative programs. This has to be set up according to the rate of build-up and consistency of the deposit. Better results have been obtained by increasing the frequency of treating using the same total amount of chemical.

Referring to the section on preventive treating, we can see the advantage of getting the chemical in contact with the deposit before these factors increase the problem. The paraffin is in a more treatable state at an earlier time.

In this type of treating the chemical is applied by means of a volume tank lubricator or poured directly into the tubing, casing or flow line.

Time should be allowed for the chemical to cut and dissolve the accumulation. This contact time will vary as to the type of chemical used and the consistency and amount of deposit.

Corrective Treating. Corrective treating has its place even though preventive or regulative treating is desired. In most instances it is applied to special problems that occur infrequently. In pulling and running bottom-hole pumps the presence of paraffin in the tubing can cause much delay and expense. Additional pulling unit time and loss of production through down time can be saved by a treating routine for such jobs. If the well is still pumping it can be treated before pulling by introducing chemical down the casing, tying bleeder back into casing, and circulating. If the well is completely off the only application is direct down the tubing. Stripping jobs can be prevented by treating as soon as the pump is unseated and working out each tight spot on the way up. The chemical will dissolve and soften the deposit allowing more paraffin to be pulled out with the pump.

Reclaiming of tank bottoms has become one of the most widely used applications for paraffin treating chemicals. It is necessary that the chemical have suspension qualities to be adaptable to this type of treating. Such treating can be done without heat.

If it is desirable to recycle tank bottoms back through heater-treaters it is found that the combination of chemical and heat is beneficial up to a certain temperature. In the fields where this was checked, it was found that after the crude oil was heated over 140°F. it decreased the effect of the chemical. This temperature will vary with different oils and chemicals. It is not necessary to use high temperatures where a paraffin treating chemical is used.

A most important fact to remember in reclaiming of tank bottoms is that of mixture. In order to get maximum recovery the chemical must be thoroughly dispersed into the bottom. This can be accomplished by a simple rolling hookup. By making a gas supply available at the base of each tank battery a portable hookup can be utilized. Items necessary for such a hookup are a length of hose capable of reaching from the gas supply to the thief hatch of the fartherest tank, and a length of ¾-inch pipe long enough to reach all parts of the bottom from the thief hatch. By putting this pipe together in four-foot lengths with union connections you will have a hookup that is simple, cheap and portable. The chemical can be poured in the thief hatch as the tank is rolled. Where gas is not available a circulating pump can be used.

In all cases it is necessary that sufficient fresh oil be used to absorb the paraffin in the bottom. It is recommended that in treating a tank bottom with no fresh oil in the tank that the bottom be thoroughly torn up and mixed with the chemical and then the tank completely filled with fresh oil and again rolled. The more fresh oil used the more paraffin can be absorbed with the lowest percentage of shake-out. A full tank of oil with a high bottom can be as easily treated as treating the bottom before the tank is filled if the bottom is properly torn up and mixed with the oil and chemical. When conditions require it, a good emulsion compound used along with the paraffin treating chemical will aid in completely cleaning up the bottom.

Although recovery may seem small in some instances, totals, including all leases over a year's period, will amount to several hundred or thousand barrels. The greatest single recoveries have been by pipe line companies due to their larger tank capacities. The following report is given as an example.

Twenty-seven hundred barrels of bottoms, consisting mostly of paraffin, were treated out through the following procedure. The bottoms had been accumulated in two 1500-barrel tanks from various leases in the field. Two extra 1500-barrel tanks were set near the tanks containing the bottoms. One extra tank was filled two-thirds full of fresh oil and the other one-third full. The tank with one-third oil was then treated with 55 gallons of paraffin treating chemical and then pumped into one tank of bottoms. This treated oil was pumped through the top of the tank and jetted to the bottoms by use of a one-inch pipe. The treated oil and paraffin that had dissolved in the process was pumped back into the hatch of the tank in which it was originally mixed. This was repeated until the oil checked 33 percent paraffin. It was then pumped into the tank two-thirds full of oil. After this was completed it was transferred to a transport barge where it was mixed with approximately 6000 barrels of oil from storage and shipped to the refinery.

The maximum acceptable paraffin content is 7 percent but in only one barge run did it exceed 5 percent and most of them ran around 4 percent. Out of the 2700 barrels of bottoms, 2400 barrels of paraffin were actually sold. The balance of 300 barrels was water, which was drawn off. The treating ratio was figured to be 10 gallons of chemical to 100 barrels of paraffin or bottoms. Some water emulsion chemical was used to help break out the water.

It might be pointed out that increased uses of refined paraffin for wax products has brought the price per barrel to $7 in some areas. The problem has been that of getting it to the refinery.

New Methods of Application. New methods of application have developed through the use of hollow sucker rods and bottom hole injection valves.

The uses of hollow sucker rods have been expanded during the last year but the most practical one has been that of treating paraffin in the tubing by the use of paraffin solvents. By use of hollow rods or macaroni strings down the tubing it is possible to make the point of injection just below the drop out point. This is the most practical method of treatment where the

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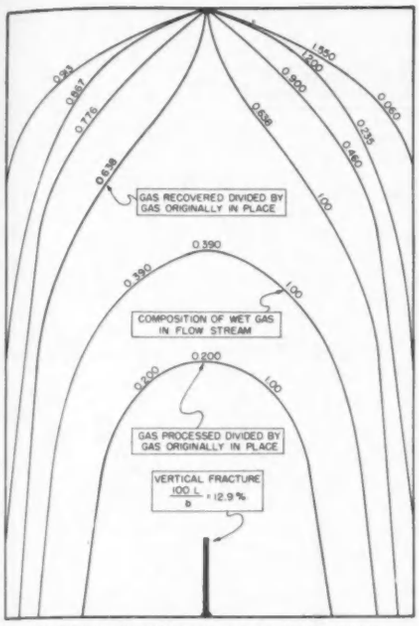
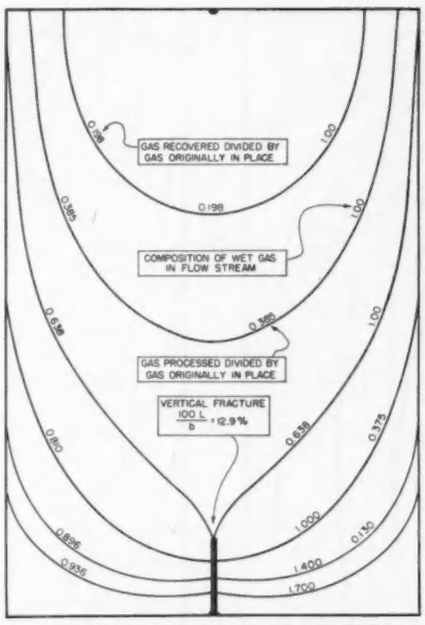

GAS RECOVERED DIVIDED BY GAS ORIGINALLY IN PLACE
COMPOSITION OF WET GAS IN FLOW STREAM
GAS PROCESSED DIVIDED BY GAS ORIGINALLY IN PLACE
VERTICAL FRACTURE
100 L/b = 12.9%

POSITION OF DRY GAS AT VARIOUS TIMES
(Flow parallel to fracture in input well)
FIGURE 1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100 L/b = 12.9%

POSITION OF DRY GAS AT VARIOUS TIMES
(Flow parallel to fracture in output well)
FIGURE 2

How Vertical Fractures Affect Cycling Program

What area is swept and what results are achieved when the . . .

- **input well is fractured?**
- **output well is fractured?**
- **flow is parallel to the fracture?**
- **flow is perpendicular to the fracture?**

By PAUL B. CRAWFORD, BAXTER HONEYCUTT, JAMES SANDERLIN and HENRY INCE
Texas Petroleum Research Committee, College Station, Texas

COMMERCIAL RESERVOIR fracturing techniques are of such recent origin that their effects on reservoir performance are not well understood in every case. It appears that a large number of formations containing both oil and gas are sufficiently susceptible to commercial fracturing that substantial increases in producing capacity may be expected after fracturing. For this reason, and others, a large number of wells have been fractured. The types of fractures which are created include vertical, horizontal and inclined. Each fracture will probably be different and fairly complex.

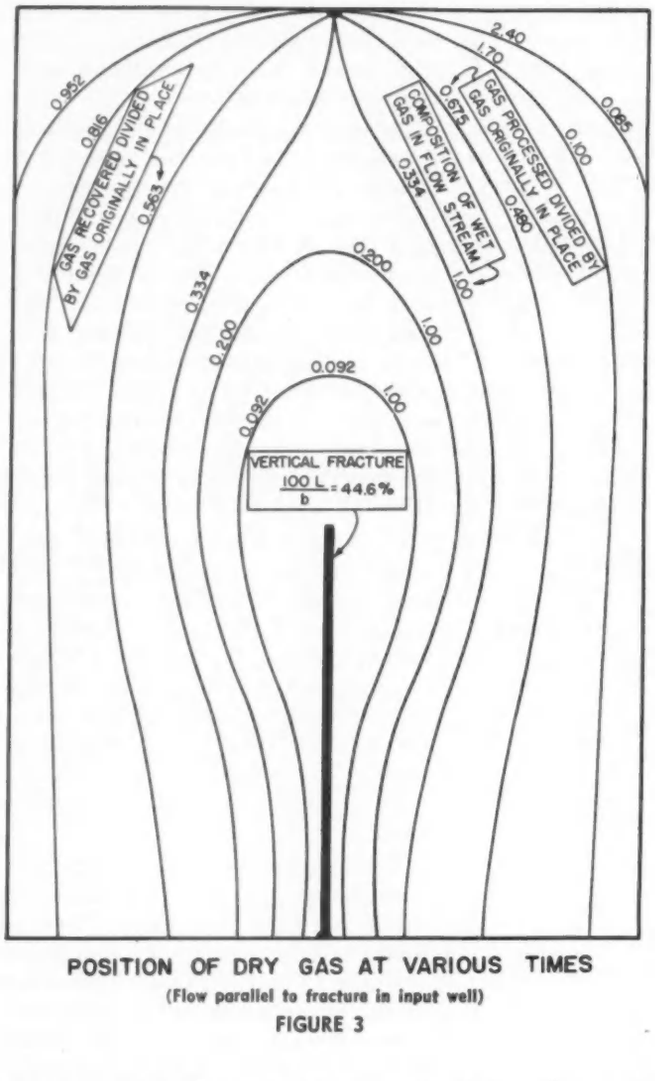
Detailed knowledge of the fracture intricacies will possibly never be known. The purpose of this work was to investigate the effect of simple vertical fractures on gas cycling programs. The study was designed to show how vertical fractures effect the area swept during the cycling program and the quantity of wet gas contained in the produced gas. The results are idealized, but the conclusions from the study may be used as a guide for expected trends in cycling vertically fractured reservoirs.

Hurst and Van Everdingen[1] presented a theoretical study on the performance of cycling unfractured distillate reservoirs. They studied a two-well rectangular pattern in which the input well was located on one end of the rectangle to the opposite edge. Figures were presented to show how the swept area and wet gas composition varied during the injection program.

The application of the parallel flow concept was expanded to indicate how theoretical flow observations on uniform homogeneous porous media could be utilized to aid in estimating results on heterogeneous, stratified reservoirs. The data and results which are presented here apply directly only to uniform homogeneous reservoirs where the particular fractured pattern shown constitutes one of an infinite array of like patterns.

Apparatus. The basic data secured in making this study were obtained on the potentiometric model. This particular model provides the isopotentials and streamlines for steady state flow at a mobility ratio of one. A description of this type model is available in the literature.[2,3,4] The reservoir used in this work consisted of a rectangular trough 20-inches wide by 30-inches long filled with approximately ½-inch of electrolyte.

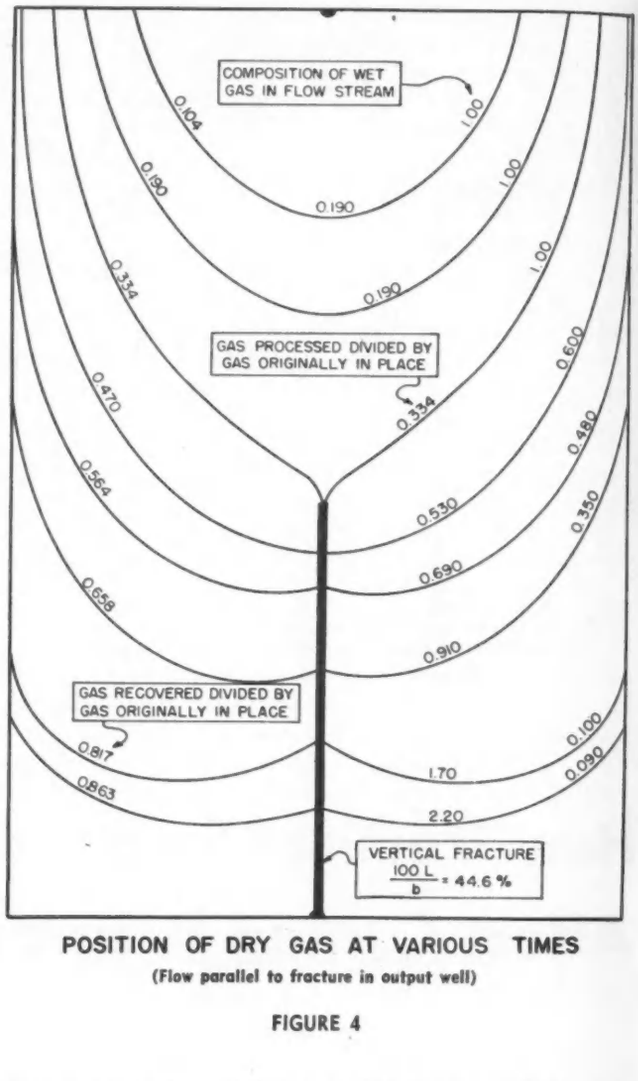
The vertical fractures were simulated by copper strips soldered to the wire which simulated the well. The copper strip was oriented to correspond to the desired direction of the vertical fracture in the reservoir. Previous work has indicated the possible usefulness of obtaining data where the fracture permeabilities were much greater than the permeability of the



POSITION OF DRY GAS AT VARIOUS TIMES

(Flow parallel to fracture in input well)

FIGURE 3



POSITION OF DRY GAS AT VARIOUS TIMES

(Flow parallel to fracture in output well)

FIGURE 4

reservoir. For this reason the use of a copper strip to represent a fracture appears to be sufficiently valid for the present work.

Vertical Fractures Parallel to Flow. Figure 1 shows a line drive vertically fractured pattern studied. The distance betwen input and output wells divided by the distance between adjacent input wells was equal to 1.5. The vertical fracture originated at the input well and extended directly toward the output well. The fracture was 12.9 percent of the distance between input and output wells. It shows the position of the dry gas at various times when cycling such a fractured pattern. At each position of the dry gas, the gas recovered divided by the gas originally in place is shown, as well as the composition of the wet gas in the flow stream and the gas processed divided by the gas originally in place.

For this particular pattern breakthrough occurred when 63.8 percent of the wet gas had been recovered. From the figure it is shown that 91.3 percent of wet gas may be obtained, but at such conditions the wet gas in the flow stream would be approximately 6 percent, and the gas processed would be equal to 1.55 times the gas originally in place.

Figure 2 shows the position of the dry gas at various times when the unfractured well was the input well and the fractured well was the output well. This is the complement to Figure 1. The results were the same whether flooding from fractured to unfractured well, or vice versa. It will be noted that the position of the advancing dry gas front moves fairly slowly along the vertical fracture. This indicates that high recoveries may be obtained, but that to do so may require the cycling of large quantities of gas.

Figure 3 shows the position of the dry gas at various times when the vertical fracture is 44.6 percent of the distance between adjacent input and output wells. The sweep efficiency is 33.4 percent. The complement of this pattern is shown as Figure 4. When the swept area is near 65.8 percent the dry gas-wet gas interface has advanced to a position which encompasses about half the length of the fracture. For these conditions the gas processed divided by the gas originally in place would be equal to 0.910; the wet gas fractional composition would be 0:35.

Comparisons of cycling performance in vertically fractured reservoirs may be made in Figure 5. This figure shows the swept areas for fractured and unfractured line drive patterns. The gas processed divided by gas originally in place is shown as the abscissa, and the wet gas recovered divided by gas originally in place is shown as the ordinate. The abscissa and ordinate may also correspond to times and fractional areas, respectively.

From the figure it will be noted that when the gas processed divided by the gas originally in place is near 0.8 the

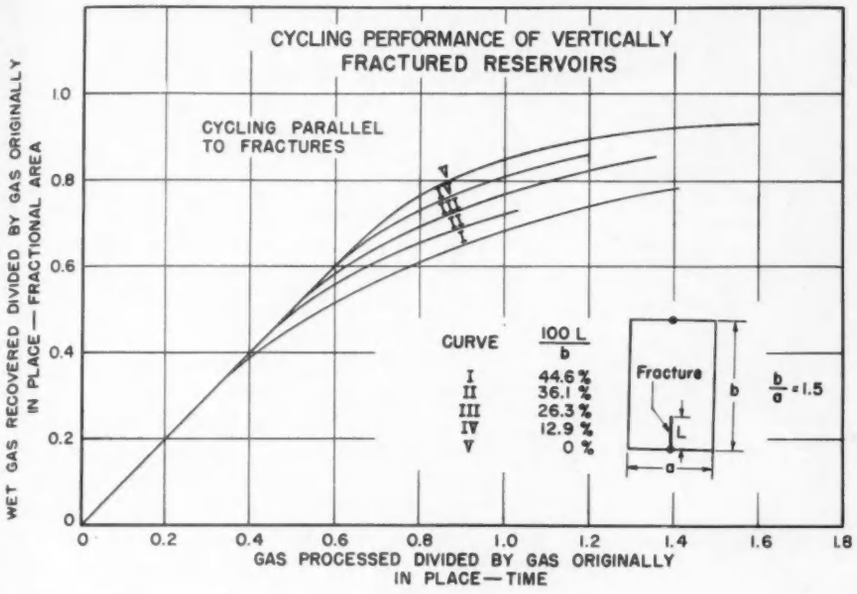


FIGURE 5

wet gas recovery may vary from near 60 to 76 percent, depending upon the length of the fracture. The former value occurs for fractures of 44.6 percent and the latter for the unfractured system. When the gas processed divided by gas originally in place is equal to 1.0 the swept areas vary from near 70 to 85 percent, the former occurring for the case of long fractures and the latter for unfractured systems.

For fractures of this type it is shown that to recover a given quantity of wet gas, more gas may have to be cured. For example, to achieve a 70 percent recovery of wet gas would require processing 70, 74, 82, 94 and 106 percent of the gas originally in place if vertical fractures of lengths 0, 12.9, 26.3, 36.1 and 44.6 percent were present, respectively.

The produced gas composition when cycling vertically fractured reservoirs is shown in Figure 6. In this figure the gas processed divided by the gas in place is shown as the abscissa. For the fracture lengths reported here the fraction of wet gas in the flow stream will remain at 1.0 until 33.4 percent of the gas in place has been processed. At that time dry gas is expected to break through if the long vertical fracture is present. After breakthrough the composition of wet gas in the flow stream will decrease.

When the gas processed is equal to the gas originally in place the produced wet gas composition if the long fracture were present would be approximately 30 percent. Approximately 20 percent wet gas is expected in the produced gas when the gas processed is equal to 1.25 volumes of gas in place. Similar results are ob-

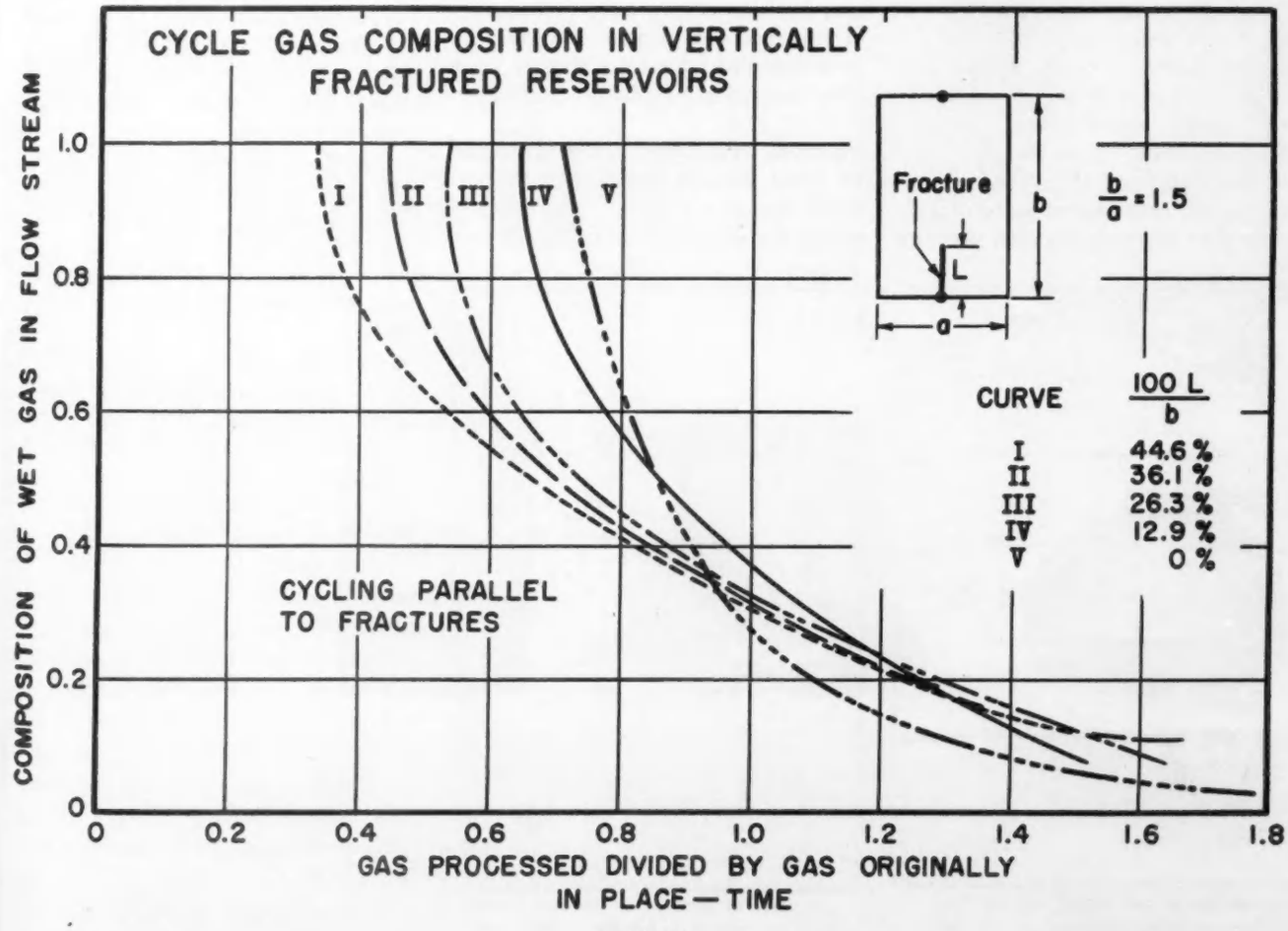
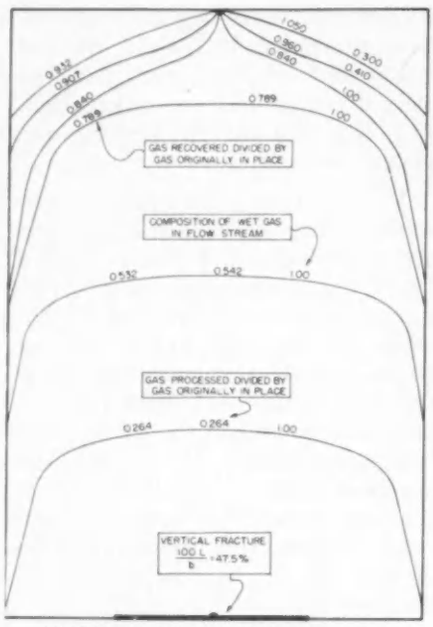


FIGURE 6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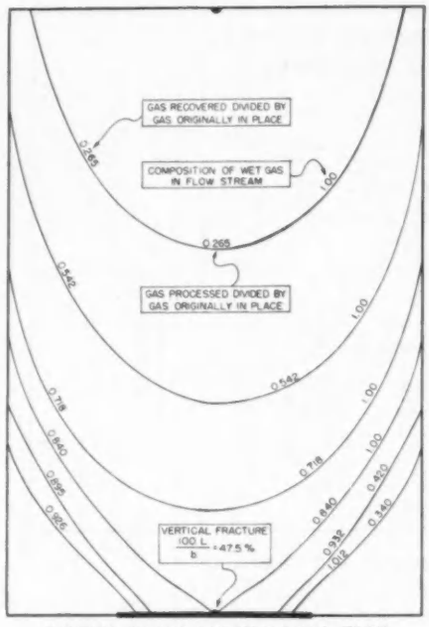
VERTICAL FRACTURE
100 L/b = 47.5%

POSITION OF DRY GAS AT VARIOUS TIMES
(Flow perpendicular to fracture in input well)
FIGURE 7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GAS PROCESSED DIVIDED BY GAS ORIGINALLY IN PLACE
VERTICAL FRACTURE
100 L/b = 47.5%

POSITION OF DRY GAS AT VARIOUS TIMES
(Flow perpendicular to fracture in output well)
FIGURE 8

tained for other fracture lengths.

On this figure the composition curves intersect. This indicates that whereas the sweep efficiency may be greater for a particular pattern, that after breakthrough the rate of decline in wet gas composition decreases as the fracture length increases. The wet gas displaced is equal to the area under the curve; it may be obtained most readily from Figure 5.

The conductivity of the fractured patterns is greater than the conductivity of the unfractured pattern. This means that per unit imposed pressure differential the fractured pattern will permit the cyling of more gas than the unfractured pattern. The conductivity increases as the fracture length increases. Although the data presented previously indicated that more gas may have to be processed if fractures of this type are present, it is possible to accomplish this in a shorter time after fracturing than before fracturing.

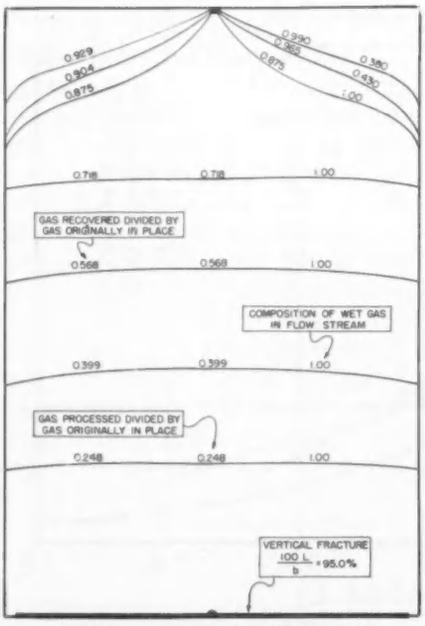
Vertical Fractures Perpendicular to Flow. Studies were made to estimate the gas cycling performance where the vertical fractures were perpendicular to flow. Such a scheme is shown in Figure 7. In this figure it will be noted that the vertical fracture is 47.5 percent of the distance between adjacent input wells. Under such conditions the sweep efficiency or swept area at breakthrough is near 84 percent. The swept area increases as more gas is processed and becomes 93.2 percent when the gas processed divided by the gas originally in place is near 1.05.

Figure 8 is the complement to Figure 7, and shows the position of the dry gas at various times when the fractured well is the output well. The shapes of the dry gas areas differ in Figures 9 and 10, but the effluent behaviors are identical.

Figure 9 shows the position of the dry gas at various times when the vertical fracture is 95 percent of the distance between adjacent input wells. Note on this figure that when 24.8 percent of the gas has been displaced that the dry gas-wet gas interface is substantially a straight line. This indicates a piston-like action for cycling reservoirs having fractures of this type. This piston-like action persists until approximately 70 percent of the wet gas has been displaced. Afterwards, as the wet gas tends to approach the output well, radial flow or substantially radial flow exists, and the familiar cusp is obtained.

When the swept area is 92.9 percent that the gas processed divided by the gas originally in place is still less than 1.0. At this time the wet gas in the flow stream would be near 38 percent. Although the swept area for this type pattern may be in excess of 90 percent these data should be multiplied by the volumetric displacement factor. This would include the effect of permeability variations and stratification which occur in the reservoir. The volumetric sweep efficiency may be only 20 to 50 percent. Perhaps a more accurate figure is obtained by utilizing the present data and multiplying the results by the factors obtained when the parallel flow concept is applied.

Figure 10, the complement of Figure 8, shows the results when the unfractured well is the input well and the fractured well is the output well. The same data apply for each case. Within the area near the injection well substantially radial flow exists. Notice that the fractured well, after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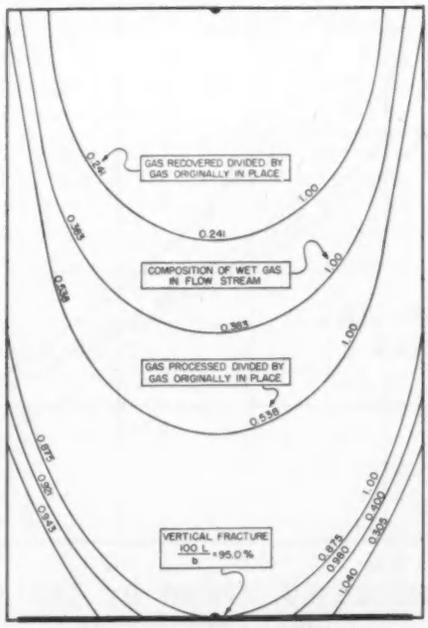
VERTICAL FRACTURE
100 L/b = 95.0%

POSITION OF DRY GAS AT VARIOUS TIMES
(Flow perpendicular to fracture in input well)
FIGURE 9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GAS PROCESSED DIVIDED BY GAS ORIGINALLY IN PLACE
VERTICAL FRACTURE
100 L/b = 95.0%

POSITION OF DRY GAS AT VARIOUS TIMES
(Flow perpendicular to fracture in output well)
FIGURE 10

Carries a lot of

WEIGHT

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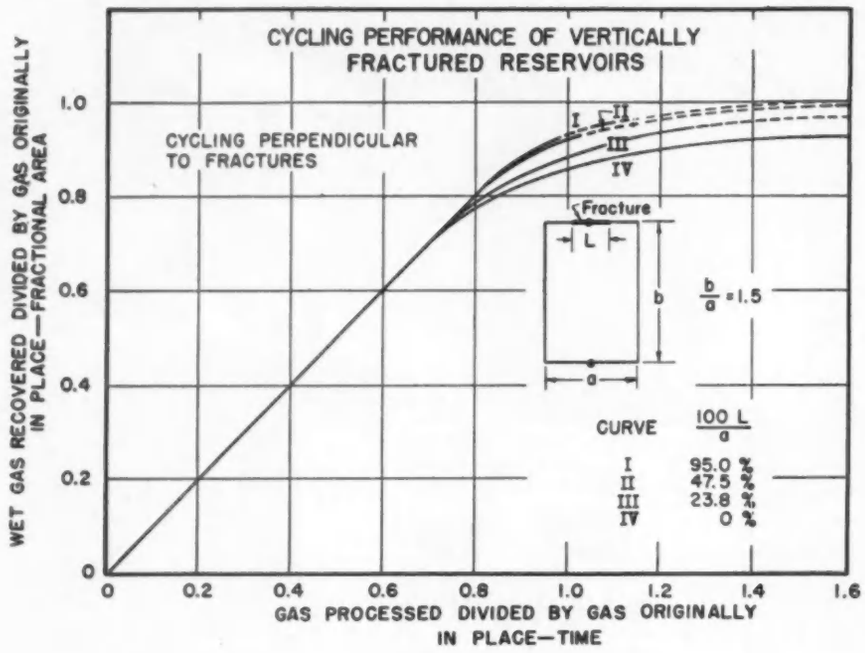

FIGURE 11

break-through, the dry gas-wet gas interface moves outward along the fracture.

Figure 11 shows the swept areas in vertically fractured reservoirs where cycling is perpendicular to the fractures. The data are shown for the case in which the fracture length varied from 0 to 95 percent of the distance between adjacent input wells. For the long fracture it will be noted that areal efficiencies near 100 percent may be achieved when the gas processed divided by gas originally in place is near 1.6. Swept areas near 97 percent were achieved when the fracture was 47.5 percent of the distance between wells.

Comparing these data with those of Figure 5 shows that this type of fracture is much more efficient than those parallel to the flow. For the patterns show here to achieve a swept area of 90 percent would require processing 0.93, 0.96, 1.07, and 1.25 volumes of gas originally in place if fractures of lengths 95, 47.5, 23.8 and 0 percent were present, respectively. Fractures of this type may permit very high recoveries if a proper cycling program is adopted. The fractures shown in Figures 3 and 10 are the same type, i.e., vertical fracture originating at the well, the primary difference being that in the latter case cycling is conducted perpendicular to the fractures. The wide variations in performance shown in Figures 3 and 10 emphasize the necessity of making a study of the fracture prior to initiating the cycling program.

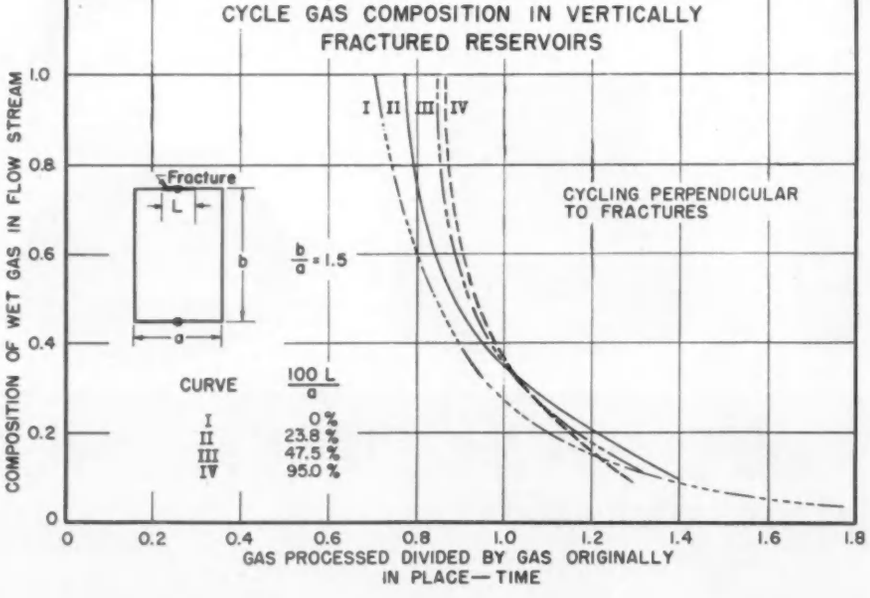

FIGURE 12

Figure 12 shows the produced gas composition when the fractures are perpendicular to flow. Break-through is expected to occur when 70.6, 78.0, 84.0 and 87.5 percent of the wet gas has been displaced for fractures of length 0, 23.8, 47.5 and 95 percent, respectively. After break-through the fractional wet gas decreases very rapidly. When the volume of gas processed is equal to 1.2 volumes of gas originally in place the fractional wet gas is expected to be 0.15 to 0.20, depending on the fracture length.

Vertical fractures of the type described here increase the pattern conductivity. This implies that cycling perpendicular to a vertical fracture may not only increase the wet gas recovery, but the program may also be accomplished in a shorter time than if no fractures had occurred. An increased well spacing may be appropriate for fractured reservoirs.

Studies were made to estimate the cycling performance in vertically fractured reservoirs where cycling was perpendicular to equal and opposite parallel, vertical fractures. The results of this study are shown in Figure 13. This figure shows the data for the case in which the fracture length varied from 0 to 100 percent of the distance between adjacent input wells.

Curve I shows the results when the fracture length is 100 percent of the distance between adjacent input wells. This means that the fracture connects the wells and linear flow will occur. For this condition the sweep efficiency will be 100 percent and will be obtained with a minimum of gas processed. This is an ideal line and may constitute an ultimate objective.

Curve II shows the performance when the equal and opposite fractures were 23.5 percent of the distance between adjacent input wells. The sweep efficiency was 80 percent. When the gas processed divided by gas originally in place is equal to 1.0, the wet gas recovery is expected to be near 88 per-

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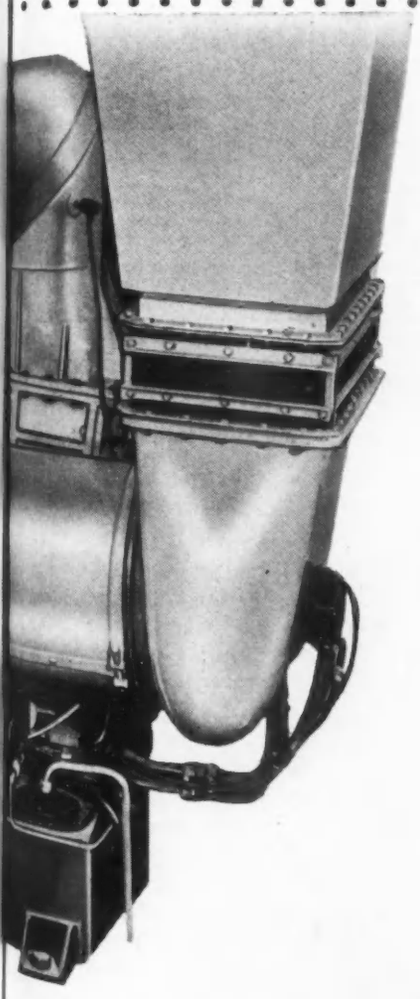

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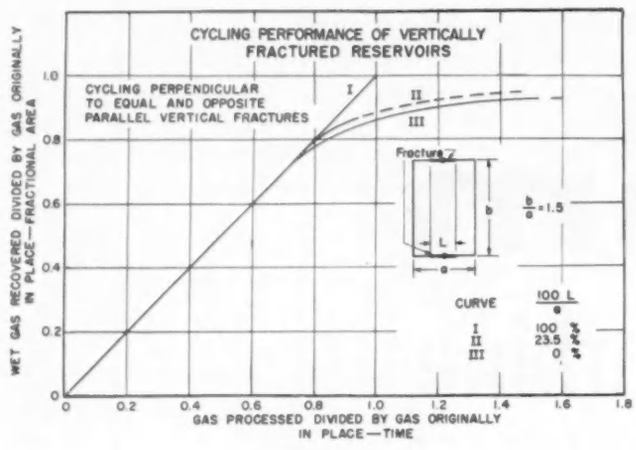

CYCLING PERFORMANCE OF VERTICALLY FRACTURED RESERVOIRS
CYCLING PERPENDICULAR TO EQUAL AND OPPOSITE PARALLEL VERTICAL FRACTURES
WET GAS RECOVERED DIVIDED BY GAS ORIGINALLY IN PLACE—FRACTIONAL AREA
GAS PROCESSED DIVIDED BY GAS ORIGINALLY IN PLACE—TIME
Fracture
CURVE
100 L/a
I 100 %
II 23.5 %
III 0 %
b/a = 1.5

FIGURE 13

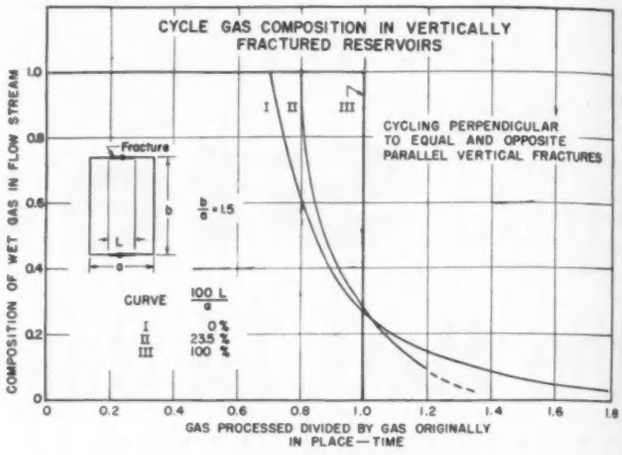

CYCLE GAS COMPOSITION IN VERTICALLY FRACTURED RESERVOIRS
CYCLING PERPENDICULAR TO EQUAL AND OPPOSITE PARALLEL VERTICAL FRACTURES
COMPOSITION OF WET GAS IN FLOW STREAM
GAS PROCESSED DIVIDED BY GAS ORIGINALLY IN PLACE—TIME
Fracture
CURVE
100 L/a
I 0 %
II 23.5 %
III 100 %
b/a = 1.5

FIGURE 14

cent. Only 85 percent would be recovered if no fracture had occurred.

Curves II and III show that little additional wet gas may be expected by cycling beyond 1.2 volumes of gas originally in place. This applies only for uniform homogeneous sands, where the sweep efficiency is high. If stratification, permeability variations, or fractures parallel to flow exist, then considerable quantities of wet gas may be recovered after cycling beyond 1.2 volumes of gas originally in place.

Figure 14 shows the fractional wet gas in the effluent when cycling perpendicular to equal and opposite, parallel, vertical fractures. Curve I shows the results for the unfractured pattern. Break-through occurs at 70.6 percent. The wet gas fraction approaches 0.15 when the gas processed divided by gas originally in place is near 1.2. Curve II presents the wet gas composition when the fractures are 23.5 percent of the distance between adjacent input wells. Break-through occurs at 80 percent, and the wet gas fraction approaches 0.15 when approximately 1.12 gas volumes have been processed.

Curve III is an ideal line and may constitute an ultimate objective in cycling techniques. The effluent is 100 percent wet gas until break-through. At break-through the swept area is 100 percent. After break-through the effluent is 100 percent dry gas.

Water-Flooding Applications. The data and results which are presented here have been described in terms of gas cycling. The same data may apply to water-flooding provided steady state conditions exist; the mobility ratio is one; the reservoir is uniform and homogeneous, and the effects of gravity are neglected.

ACKNOWLEDGMENT

The authors wish to thank Dr. George H. Fancher, Director, for encouraging the work. Appreciation is expressed to the Research Committee for permission to publish the results. R. E. Collins and James Tillotson assisted in the model work and computations.

REFERENCES

[1] Hurst, W., and Van Everdingen, A. F., "Performance of Distillate Reservoirs in Gas Cycling," Trans. AIME, Vol. 165, Page 36 (1946).
[2] Horner, W. L., and Bruce, W. A., "Electrical Model Studies of Secondary Recovery of Oil in the United States," Second Edition API (1950) 195.
[3] Lee, B. D., "Potentiometric Model Studies of Fluid Flow in Petroleum Reservoirs," Trans. AIME (1948) 174, 41.
[4] Muskat, Morris, "The Theory of Potentiometric Models," Trans. AIME (1949) 179, 216.

Why Not Dissolve Your Paraffin Problem?

Continued from Page 242

well cannot be treated down the casing for reasons of circulation problems or where packers are used. This is effective both on pumping and flowing wells. Installations of hollow suckers rods in flowing wells can be utilized when the well is put on a pump.

Automation of leases where paraffin conditions exist necessitates a preventive treating program. Paraffin build-up on automatic equipment causes improper function and errors in metering and measuring as well as actual failure of operation.

Increased savings have been made through special application as shown in the following report. In the Lake Veret area of the Louisiana Gulf Coast, paraffin accumulation in the tubing was causing a decrease in flowing pressure and production. Due to storm chokes set at 2000 feet, the wells previously could only be cut to this depth but it was found that the drop-out point was below this level.

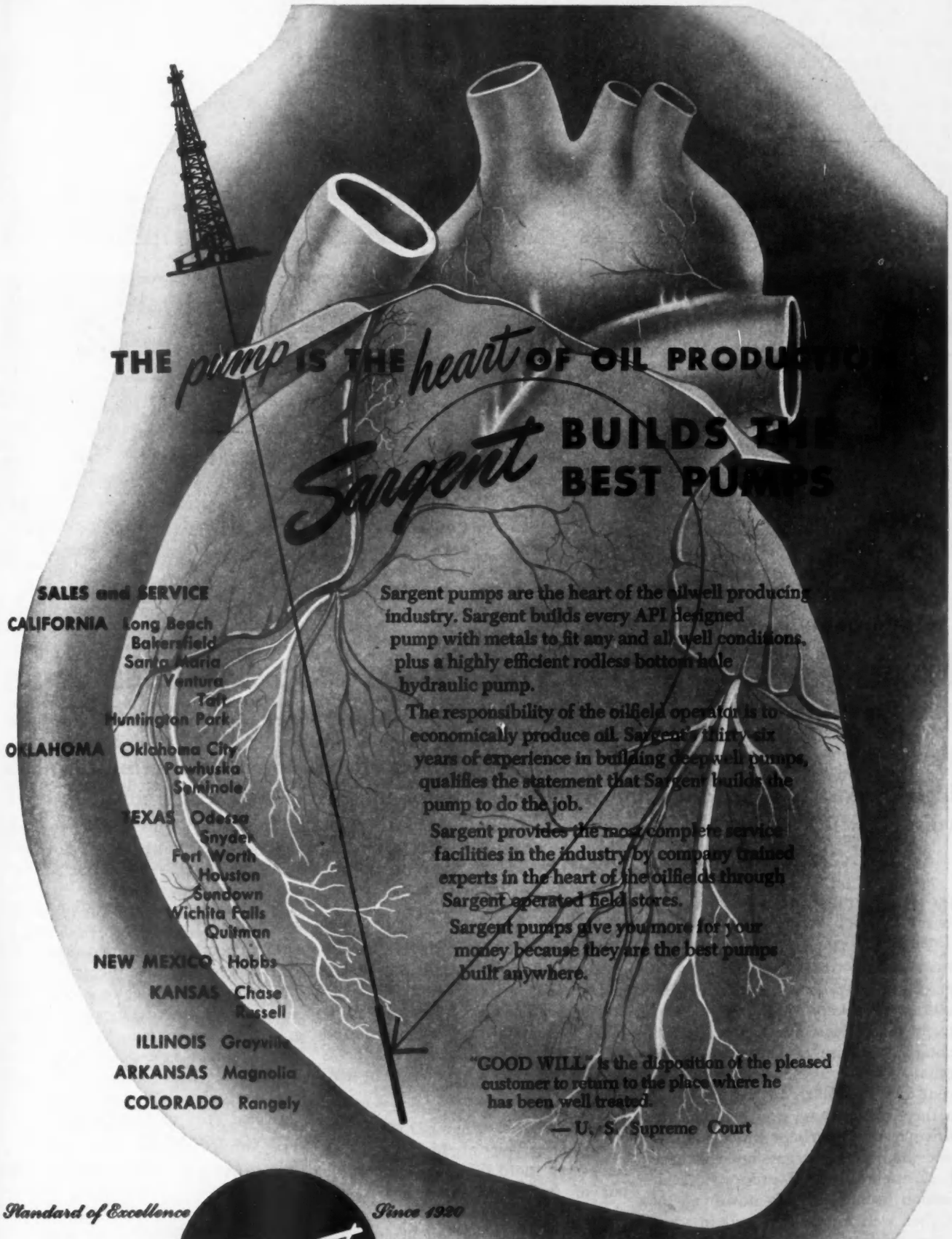
The treating fluid used was a mixture of 110 gallons of paraffin treating chemical and 110 gallons of crude oil. This mixture was pumped down the tubing and spotted between 2000 and 3000 feet. Oil was used as a chaser and pump pressures up to 4000 pounds were needed for the job. Wells were shut in for a period of 14 to 18 hours with the treating fluid being in direct contact with the paraffin accumulations. Results were obtained as shown on Table 1. Well "B" was cut back to 92 barrels of oil per day on a 7/64 choke because of allowable. Plans had been made to move in a work-over rig to pull and clean tubing. This was not necessary after treating. This was a water job and pulling expenses would have been excessive.

ACKNOWLEDGMENT

The cooperation of BrakeSol, Inc., in assembling and authorizing the publication of this article is gratefully acknowledged.

TABLE 1

Well No.	Depth	Gravity API	Flow Time	Condition Before Treating: Contact Pressure	Condition Before Treating: Daily Production	Condition Before Treating: Choke	Condition After Treating: Flow Pressure	Condition After Treating: Daily Production	Condition After Treating: Choke
A	7450′	37°	18 hr.	0–200 psi	15 bopd	14/64	960 psi	92 bopd	8/64
B	7450′	37°	14 hr.	600 psi	73 bopd	14/64	1050 psi	40 pobd	9/64
C	6742′	36°	14 hr.	225 psi	50 bopd	9/64	610 psi	86 bopd	6/64



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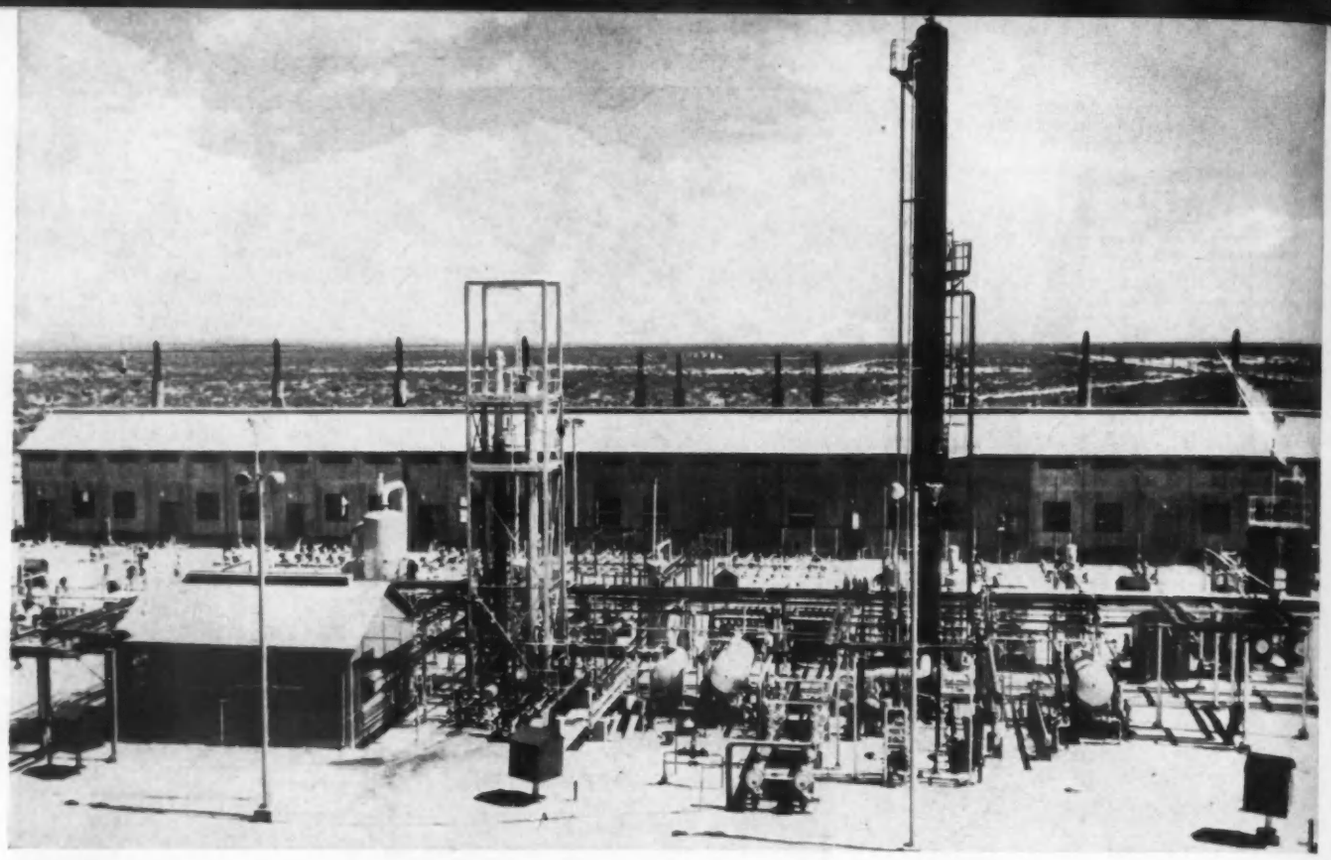

Block 31 compressor plant at Crane County, Texas, where Atlantic is injecting natural gas at high pressure to increase oil recovery.

High Pressure Gas Injection Is a Success

After extensive tests, The Atlantic Refining Company is optimistic about high pressure gas injection and its possibilities for increasing recovery from deep reservoirs.

By H. A. KOCH, JR., The Atlantic Refining Company, Dallas

THE ATLANTIC REFINING COMPANY's high-pressure gas injection process is a process to increase the ultimate recovery of oil from relatively deep reservoirs. Oil recoveries obtained by use of this process are estimated to be in the order of 60 percent of the in-place oil. This is about a threefold increase over solution gas drive recovery. Where water-flooding and high-pressure gas injection are both applicable, high-pressure gas injection usually has the advantage of higher well injectivities and in some cases higher productivities (higher reservoir pressures).

The purpose of injecting gas at high pressures is to obtain a miscible phase displacement of the in-place oil. While the injection pressures required are relatively high (usually greater than 3000 pounds per square inch gage), the increased recoveries and higher production rates have justified the capital investment required to carry out the process. Atlantic is now practicing the process in two fields.

How It Works. When gas is injected into a reservoir at high pressures, something more than a mere pushing out of the oil occurs.[1,2,3,4] An exchange of hydrocarbon components between the gas and oil takes place, resulting in a modification of the properties of both phases, particularly when the oil is undersaturated. The LPG-natural gasoline components (largely C_2 through C_6) are the main materials involved in this exchange. The change in concentration of the LPG-natural gasoline components resulting from the transfer works in the direction of making the gas and oil which are in contact more alike and results in a more efficient displacement. In the extreme when the displacing phase is enriched to such an extent that it becomes miscible with the reservoir oil, the oil is essentially "washed out" of that portion of the reservoir contacted.

Advantages Derived from the Process

- High ultimate recoveries.
- High well productivities (associated with high reservoir pressures).
- Higher ratio of producing wells to injection wells than is the case of a typical water-flood. Since gas flows into the injection wells easier than water, one gas injection well can

support more producing wells than can one water injection well.

Possible Disadvantages

- A fairly large initial investment is required to start a full scale operation.
- Poor sweepout pattern efficiency. This is particularly true in those reservoirs which contain large scale inhomogeneities such as fractures which lead to stratification, etc.

However, in most cases when the primary depletion mechanism is solution gas drive, the potential stakes to be gained by using the high pressure gas injection process are large.

Reservoir Qualifications. While it is difficult to set forth all of the qualifications necessary to make the high-pressure gas injection process work, a few generalizations are in order. Following these generalizations we have listed the properties of some typical reservoirs which are thought to be susceptible to high pressure technique.

Some of the factors for consideration in field application are:

1. **Pressure**—Injection pressures are usually greater than 3000 psig. (This factor sets the minimum depth.)

2. **Reservoir Fluid Composition**—A very important factor in the process. Favorable reservoir fluids will contain greater than about 30 mole percent C_2-C_6, and will have a C_{7+} fraction whose molecular weight is less than about 240. Experience has shown that reservoirs producing high gravity stock tank oil (particularly above 40 API) are worth looking at. Some supporting data on this factor are presented later in the discussion.

3. **Undersaturation**—This is an important factor in the process. The reservoir fluid must be undersaturated with respect to the injection pressure in order to obtain the proper exchange of C_2-C_6 components. Miscibility depends on the concentration of these components at the displacing front. The amount the pressure has to be increased above saturation pressure to obtain miscibility is a function of the reservoir fluid composition. In those cases where pressure requirements limit the high pressure gas sweep to an immiscible phase displacement, oil recovery increases with the degree of undersaturation.

4. **Injected Gas Composition**—It was demonstrated in long core displacements in the laboratory that the reservoir fluid composition and reservoir pressure were more important factors than the injected gas composition in obtaining a miscible phase displacement. This was particularly true for the composition range of gases typically encountered in the field. For example, a gasoline plant tail gas containing 85 percent methane and 15 percent ethane was found to be just as effective as a richer field separator gas containing 70 percent methane and 30 percent heavier components. If significantly richer gases are used, such as a propane or ethane rich stream from a gasoline plant,[5] pressure requirements for miscibility may be lowered somewhat. For our field applications of the high-pressure gas injection process, we have found it to be more economical to obtain a miscible phase displacement through controlling reservoir pressure rather than by using a highly enriched injection gas. We have concluded that injected gas composition is a relatively unimportant variable over the composition range of gases usually encountered in the field.

5. **Reservoir Temperature**—Reservoir temperature has a relatively unimportant effect on the pressure required to obtain a miscible phase displacement. Most of the reservoir fluids which Atlantic has found to be susceptible to high pressure gas injection have temperatures in excess of 140° F. High temperatures act toward making the heavy ends in the reservoir fluid a little more soluble in the injected gas phase, but the effect is rather small over the range of field temperatures.

Properties of Susceptible Fluids. Table 1 lists some of the fluids which were tested in our laboratory for possible high pressure gas injection operation. A series of displacements of these fluids was made from unconsolidated sand packed columns at various pressures. From the oil recovery obtained, and from visual observation of the effluent streams, the pressure required to obtain a miscible phase displacement was determined. The miscible pressures determined for these reservoir fluids ranged from about 3400 pounds per square inch to about 4800 psi. Those fluids which contain the highest concentrations of C_2-C_6 components and the lowest molecular weight C_{7+} fraction have the lowest pressure requirements for miscibility.

Table 1 shows the fairly wide range of reservoir conditions which can be handled successfully in the high pressure gas injection process. For example, the producing gas-oil ratios varied from 200 to 2000 scf/stb, the reservoir temperatures varied from 140° F. to 237° F., and the saturation pressures varied from 800 psig to 3780 psig.

Field Application. Atlantic has two field applications of high pressure gas injection under way at the present time. The first and larger of these two, which was started in 1949, is the Block 31-Devonian operation in Crane County, Texas. Figure 1 is a view of the 9500 horsepower compression plant handling about 40 million cubic feet of gas per day. The high pressure gas leaves the plant at 4000 psi. Oil is being recovered from the Devonian at the rate of 15,350 barrels per day. The injection rate is designed to exceed the voidage rate to repressure the reservoir. Ultimate recovery by this process is expected to be about 60 percent of the oil originally in place. This is a 3-4 fold increase over the recovery expected

TABLE 1

Properties of Some Reservoir Fluids Which Were Shown in the Laboratory to Be Susceptible to the High Pressure Gas Process at Operating Pressures From 3400-4800 psi

COMPONENT	COMPOSITION—Mole Percent					
	A	B	C	D	E	F
H_2S	....	....	....	....	....	....
N_2	....	....	2.9	0.8	....	....
CO_2	....	1.5	....	....	....	....
C_1	42.7	51.4	24.0	13.0	14.3	35.9
C_2	12.5	9.7	8.1	13.2	6.8	6.8
C_3	10.2	8.8	9.1	13.3	5.9	8.3
C_4	6.2	5.4	5.4	8.4	7.4	6.9
C_5	3.8	2.6	4.6	6.1	6.8	4.7
C_6	3.3	1.8	5.4	4.5	6.8	4.6
C_{7+}†	21.3	18.8	40.5	40.7	52.0	32.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
M.W. C_{7+}†	191	142	201	197	186	176
Saturation Pressure, psig	2,760	3,780	1,775	905	800	2,860
Reservoir Temperature, °F	140	237	142	176	144	167
Stock Tank Oil Gravity, °API	47.3	47.1	35.5	45	43.1	45
Gas-Oil Ratio, SCF/STB	1,212	2,042	779	476	216	1,116

from solution gas drive. The oil which is not produced from the reservoir (40 percent of the oil originally in place for the Block 31 operation) is left in areas not contacted by the high pressure gas. Factors which relate to the volume of the reservoir contacted are sweepout pattern efficiency and by-passing and channelling efficiency. The sweepout pattern efficiency for the Block 31 operation is 77 percent based on an approximate inverted nine-spot pattern. A bypass and channelling efficiency factor of 80 percent was used to cover effects of reservoir inhomogeneities. These two factors when combined with the unit displacement efficiency of 98 percent gave a calculated ultimate recovery of 60 percent of the original oil in place. (Recovery = 98 × 0.8 × 0.77.) On January 1, 1956, the recovery from the reservoir was about 15-20 percent of the ultimate reserves.

The Block 31 project has experienced some of the equipment problems expected of high pressure operations, but shutdown time has been very low. The reservoir by and large is performing about as expected. One edge well in the south part of the field showed an increased gas-oil ratio some time in 1953, but the behavior of this well is not typical of the rest of the field. A testing program is under way to determine possible causes of the high ratios from this one well.

A second (and much smaller) high-pressure gas injection project was initiated in January, 1956. Here gas is being injected into the 10,400 foot sand reservoir at Neale field, Beauregard Parish, Louisiana. At present, about 2 to 3 million cubic feet of gas per day are being injected into the reservoir at a bottom hole pressure of about 5300 psi in an effort to repressure the reservoir to the original 4300 psi. No performance data are available at present; but if the reservoir behaves as predicted, recoveries here should exceed 50 percent oil originally in place.

REFERENCES

[1] Whorton, L. P., and Kieschnick, W. F., Jr., "A Preliminary Report on Oil Recovery by High Pressure Gas Injection," *Drilling and Production Practices*, 1950, page 247.

[2] Slobod, R. L., and Koch, H. A., Jr., "High Pressure Gas Injection," *Drilling and Production Practices*, 1953, page 82.

[3] Whorton, L. P., and Brownscombe, E. R., Method of Recovering Desirable Petroleum Hydrocarbon Fractions from Producing Oil Reservoirs, United States Patent Nos. 2,724,437 and 2,724,438.

[4] Griffith, B. L., and Hollrah, V. M. "New High Pressure Gas Injection Method," *Oil and Gas Journal*, June 30, 1952, page 86.

[5] Stone, H. L., and Crump, J. S., "The Effect of Gas Composition Upon Oil Recovery by Gas Drive," *Trans. AIME*, 1956, page 105.

How Do You Solve Your Water-Flood Problems?

Here are some questions on water-flood activity asked by Mid-Continent operators . . . and the answers given by experts.

By ANTHONY GIBBON
World Oil Staff

Approximately 175 water-flood operators from the Mid-Continent area recently attended the annual "Quiz Program" at Bartlesville, Okla., sponsored by the Kansas-Oklahoma Water-Flooding Operators. Wade Watkins of the Bureau of Mines, Bartlesville, was program chairman and W. A. Heath of Earlougher Engineering, Tulsa, acted as moderator. The panel of experts included E. E. Funk, Cities Service Oil Company, and Z. Z. Hunter, Phillips Petroleum Company, of Bartlesville; W. E. Stiles, Buffalo Oil Company, Dr. C. W. Ziemer, Sunray-Mid-Continent Oil Company, Don Hockaday, Kewanee Oil Company, Paul Shanor, Bradley Producing Corporation, R. W. Amstutz, Earlougher Engineering and L. L. Brundred, Climax Molybdenum Company, all of Tulsa.

A variety of important questions relating to fracturing were answered during the quiz, which follows herewith:

Q. *Where should the line be drawn as to whether fracture treatment should be employed as a preliminary preparation to water injection? Consider such factors as permeability, prior production, depth, lithology, and ultimate recovery.*

A. It was generally agreed that if 1½ barrels of water per acre-foot per day can be injected into the sand during the initial injection period, fracturing should not be employed as a preliminary measure.

Q. *Can 0.0 permeability be successfully sand fractured?*

A. If the sand contains enough oil fracturing, it might be alright. Usually 0.0 permeability sand has a low porosity and a high water content making it practically impossible to recover any oil. It is entirely possible to fracture sands that have 0.0 permeability but it takes a large and a highly successful fracture job. If the entire reservoir is of this low permeability, in all probability not more than 10 acres would be drained.

Q. *What is the maximum injection pressure, per foot of depth, that will not cause fracturing of the formation?*

A. The panel was in general agreement that a pressure per foot of depth cannot be set because the pressure at which a formation will rupture varies widely. For example, in Nowata County, where the wells are about 600 feet deep, it is considered safe to inject water at 750 pounds, bottom-hole pressure.

In Greenwood County, Kansas, at a depth of 2000 feet, 1400 to 1500 pounds, bottom-hole, pressure is safe. However, in the Burbank field, Osage County, Oklahoma, there have been wells that break down from a hydrostatic head of water or less. Often an idea of the breakdown pressure can be obtained from sand fractured wells in the area. Offhand, the oil gradient plus the sand fracturing breakdown pressure will give a general idea of the water-injection breakdown pressure in a water flood. In general, it will be necessary to test the formation to determine the maximum injection pressure safe to run.

Q. *Can old wells be successfully sand fractured and does fracturing increase the water:oil ratio and the produced fluids?*

A. In the Burbank field, approximately 90 percent of the producing wells, which were mostly old wells, were fractured. In most cases, the oil and water production was increased substantially, but there was no significant increase in the water:oil ratio.

In the Olympic field, Hughes and Okfuskee counties, Okla., approximately 20 producing wells, mostly old wells, were fractured. Five of these jobs were successful, increasing the oil production as much as five fold and the water production about the same. However, the water:oil ratio was increased on all but one of the wells. In general, the good results were obtained in an area that had a low permeability as compared to the rest of the Olympic field.

Q. *(1) What factors should be considered in determining the optimum charge to be used in fracturing producing wells in a water-flood project? (2) Does the age of the flood have much to do with the success of the fracturing? That is, is fracturing more effective on a water-flood during the late stages?*

A. It was generally agreed that optimum fracture treatment for a well was dependent on the reservoir permeability and that it was the condition of the well rather than its age that determined the effectiveness of the fracture. In many cases refracturing has proven successful where a light fracture was unsuccessful.

Q. *Does fracturing of input wells result in water channeling rather rapidly to some of the adjacent wells?*

A. The panel had not heard of a case where fracturing had been detrimental to adjacent wells. It usually helps injectivity. It was suggested by one of the panelists that it was better to fracture an injection well than to pressure part the sand and keep it open by increasing the injection pressure.

Q. *What is the subsequent history of a well after fracturing, does the well continue to produce water in the same proportion or does it fall off?*

A. Fractured wells will not increase in water:oil ratio any faster than wells that have not been fractured. No results have been had that would make the panel believe that abnormal water:oil ratios will be obtained in fractured wells.

Q. *What is the panel's viewpoint on holding pressures above the overburden pressure on water input wells?*

A. The concensus was that floods should not at any time be operated at pressures that will lift the overburden.

Q. *Has fracturing of water-input wells resulted in a definite increase in oil production attributable to the fracturing?*

A. One panelist knew of a few cases where fracturing increased the ultimate recovery by 10 to 15 percent.

Q. *Do you find infield drilling profitable in respect to recovering oil from watered-out pattern water floods?*

A. Inspection of cores taken from "dead spots" in several 5-spot pattern floods indicated that the areas were usually watered-out after the flood had been in progress for several years and that there was not sufficient oil left in the area to warrant the cost of redrilling.

Q. *To what degree do you find oil recoveries from pilot flood operations representative of those obtained in whole field water-flooding?*

A. In most cases operators do not consider pilot floods as a means of determining oil recoveries possible by water flooding but consider it as a means of determining well spacing, pressure, and volumes of water to be injected in the final development. A pilot flood is considered by some operators as a preliminary operation to determine if the property is floodable and as a means of determining the cost of developing the entire property.

Q. *Have there been any instances where pilot water floods that have failed have caused the abandonment of the entire property?*

A. One panelist cited a case where his company started a pilot operation in 1936 using fresh water. The project was abandoned in 1938 after they had reached a point where sufficient water could not be injected because of excessive pressure. In 1947 the company water-flooded the property again using brine and the operation has proved successful and is still in operation.

Another company increased the oil production but also increased the water production to where it was unprofitable to operate and abandoned the flood. Some years later another operator purchased the property and tried to water flood, but had about the same results.

Q. *What are the advantages of not using a pilot flood operation?*

A. It is possible to condemn a large field on the results obtained from a small pilot flood operation. If you are going to test a large field by pilot flood operation, you should use several pilot floods because it is entirely possible to choose a very poor area for the pilot operation and condemn an entire field.

Q. *What are the characteristics of a good water-flood prospect?*

A. Some characteristics of a good water-flood property are: A fairly uniform sand body; sufficient oil saturation to displace by water injection; available water supply; and sufficient oil to give enough

return to pay for the flooding operation.

Q. *(1) What have been the results obtained from selective plugging? (2) For effective selective plugging is it normally necessary to use large volumes of plugging material or will short penetrations of plugging material from the well bore be effective?*

A. One panelist stated that his company definitely increased oil production from adjacent wells by plugging back and squeezing off loose streaks in several input wells. The loose streaks were located by profile surveys. He also said they had not been able to increase oil production by adding small quantities of plugging material to the injection water. The use of plugging agents has been very successful in the Bradford field, Pa.

An experiment tried by another company was to inject a very thin slurry of cement, about ¼ sack to ½ barrel of water, by opening the bypass valve and forcing it down the input string of tubing. The rate of water injection used before the operation started was maintained during and after the injection of the slurry. Slurry was added each morning until about 2 sacks of cement had been injected. Before the test the input well was taking water at a vacuum. A test of the well showed the fluid level to be about 400 feet below the surface, after the injection of approximately 60,000 barrels of water, which wasn't enough for complete fill up. After about 2 sacks of cement had been injected the pressure gradually increased to 300-400 pounds surface pressure. Up to this time there has been no increase in oil production.

Q. *How effective are oil seals for excluding air from water supply tanks?*

A. If a small quantity of oil, say five gallons, is placed on top of the water, a seal is not obtained and oxygen will enter the water. The consensus was that an oil seal to be effective should be about 6 inches thick. However, the thickness of the seal would certainly depend upon the amount of rolling in the tank. Diesel fuel instead of crude oil is often used. In some waters, we have the evolution of gas which aids considerably in eliminating oxygen contamination. In waters of that type, oxygen is sometimes eliminated without the use of an oil seal. In waters where there is no evolution of gas and oxygen contamination is a problem, the use of a diesel oil seal is suggested. The use of old worn-out lubricating oil on top of the fluid in an Arbuckle supply well has proven successful in eliminating oxygen contamination.

Q. *If you were an independent operator who had $100,000 in cash and two properties, one having waterflooding possibilities and the other a newly discovered primary field requiring development, on which would you invest your money?*

A. This question drew a lot of comment but it was finally decided it would be better to develop the primary field and at a later date go into water flooding. —**The End**

WHAT'S BEHIND

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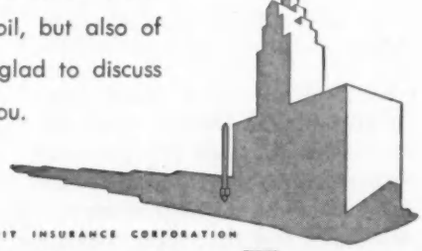

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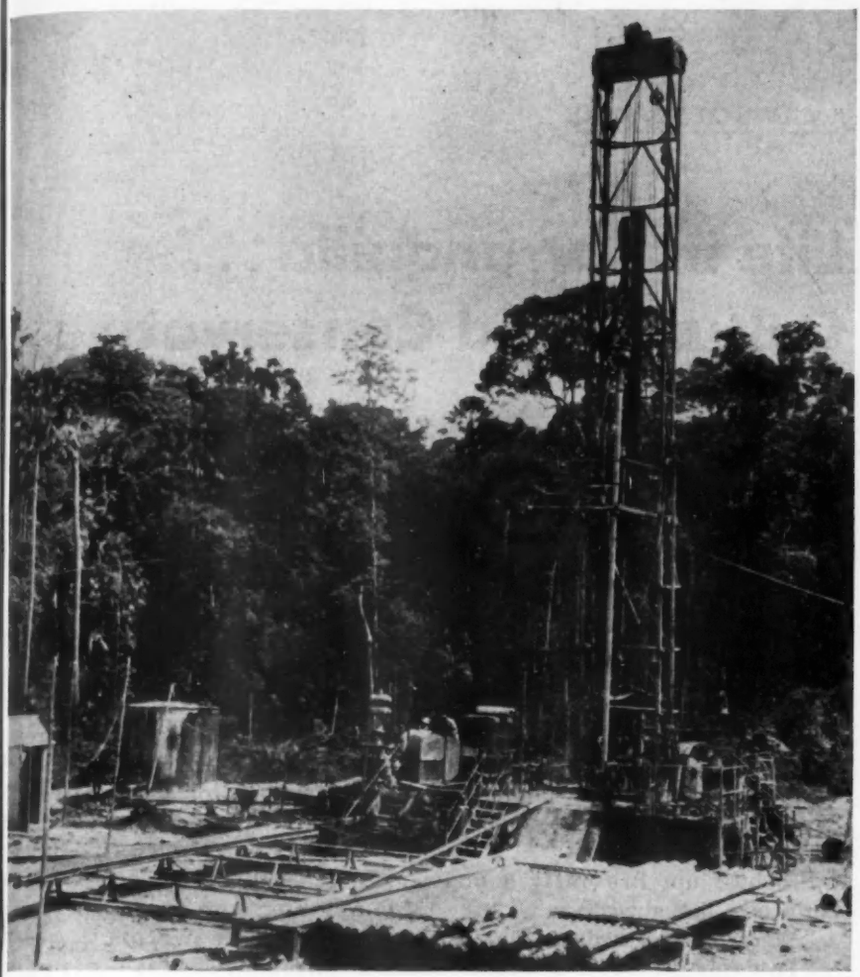


—Caltex photos

Portable rig operates in Caltex Pacific Petroleum Company's Minas field in central Sumatra where producing depth in the field is about 2250 feet. Continuing exploration and development work has built up a daily production of about 65,000 barrels of oil.

Problem-Ridden Minas Field Now Producing 65,000 BPD

Since 1939 discovery, Caltex looks back over problems overcome in setting up operations in Central Sumatra. Many of these obstacles are common to operations abroad.

ABOUT THREE MILES from Pakanbaru, in Central Sumatra, Caltex Pacific Petroleum Company has its field operational headquarters—known as Rumbai Camp. The Minas field, with 143 wells at the close of 1955, lies 15½ air miles north of Pakanbaru.

Located in almost the exact center of the island of Sumatra, about 150 miles west of Singapore, Pakanbaru is a town of 25,000. Although it is possible for passengers to reach Pakanbaru by river freighter from Singapore, the usual method is by plane from Djakarta or from Singapore via Palembang in South Sumatra. Either trip takes approximately four hours.

While the first tanker load of Minas crude did not leave the marine terminal until May, 1952, Caltex activity in Indonesia dates back to 1924 when a small group of American geologists was sent to Indonesia in an attempt to find new sources of petroleum. They investigated Java, Madura, North and Central Sumatra and Borneo. In 1930, with promising prospects, a company now known as Caltex Pacific Petroleum Maatschappij was formed to continue exploration and to acquire favorably situated lands.

Extensive exploration work continued during the 1930's and the first oil was discovered in June, 1939, followed by a second discovery in 1940. Operations, of course, were shut down during the war years.

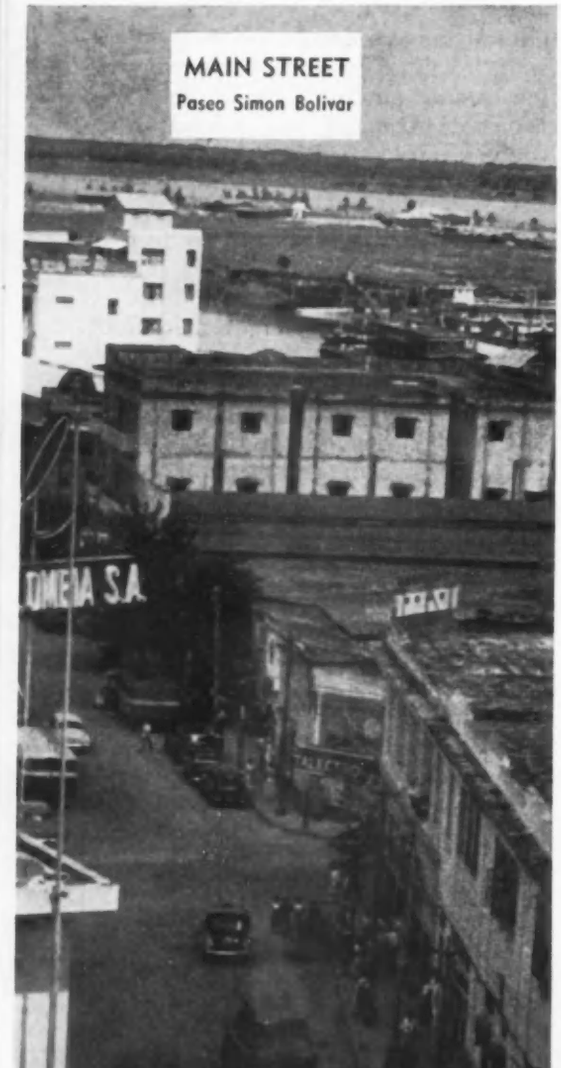
It was not until January, 1949, that a group of construction men, drillers and geologists could begin the task of establishing a camp and preparing for further drilling and exploration work. Preparation for returning to Sumatra had been made well in advance so that as soon as personnel were able to enter the Central Sumatra area, a steady stream of supplies and equipment began arriving.

Handling of materials and equipment was the first major problem. Three miles downsteam from Pakanbaru on the opposite side of the river, a site was selected which is now called Rumbai terminal, named for a stream which enters the Siak River at that point. As soon as possible, work began on the erection of a stiffleg derrick capable of handling over 25-ton lifts. In the meantime, launches, tugs, barges and two specially designed landing craft had been constructed. The landing craft were modeled after the U. S. Navy LCM but made slightly wider to accommodate tractors with wide tracks.

Bachelor quarters went up first, but by about the end of 1950 a group of 20 family prefab combinations were completed and about 20 houses had been rebuilt in the town of Pakanbaru. This appeared to take the housing problem past the critical stage by providing quarters for a sufficient number of supervisory staff to cope with construction, as well as drilling operations. However, at this time, the decision was made to proceed with the installation of production facilities at top speed. Designs were completed and urgent orders for materials released. An agreement was drawn up with a contractor, and additional Caltex engineering and construction men were assembled for transfer to Sumatra.

This project immediately increased requirements for facilities, equipment

Continued on Page 278



A CAMP CITY PROFILE

Life in Barranquilla . . . Cultured and Conservative

Advent of oil has affected Colombian port's prosperity, but it has not regimented its social thinking.

By JAMES JOSEPH

W. J. JEWELL, Concesionaria de Petroleo Shell Condor's area representative for Barranquilla and Cartagena, swivelled around in his chair.

"Like one?" he asked, proffering a "Pielroja," Columbia's most popular cigarette.

I lighted up. Presently a pretty Latin miss brought coffee.

"Azucar?" she asked.

"Two cubes, please," I said.

I couldn't help thinking that if she also brought a dish of bananas, we'd have had represented in one room, Colombia's chief exports: coffee, petroleum, bananas, and sugar—in that order.

Twenty-four hours in Barranquilla —and you like the place. Spend a week and you are the town's chief booster. For in Barranquilla things move precisely, unhurried—yet purposefully.

There is none of Bogota's hustle. The pace is refreshing compared to Caracas. The coming of oil has done little to speedup the good life which is Barranquilla's. Yet oil has strengthened the town's position as Colombia's main port, gateway into the interior. Barranquilla and its citizens, however, take their increasing importance with studied nonchalance.

Along the broad Magdalena's west bank, near Shell Condor's office, are pipe yards, warehouses and barging docks. Uptown are offices of the half dozen major concessionaires who maintain staffs in Barranquilla. But Colombia's third largest city (population 225,430), its major port, is not in the throes of a boom. The Colombia peso, worth 39 cents U. S., buys more than in Caracas — a good bit more.

Barranquilla had come of age as Colombia's gateway in 1939, just when petroleum activities greatly accelerated. It was then that the Magdalena's silted boca—its mouth—was dredged. Puerto Colombia, once Barranquilla's trans-shipment port, was all but closed down. Now Carribean-going ships with 19-20 foot drafts can pass the bar, unload directly at Barranquilla docks.

Like most oil families, the Jewells live in the pleasant Prado district, site of the famed Del Prado hotel and the Barranquilla Country Club, with its 18-hole golf course, both hubs of society. And in Barranquilla, American, British, Dutch and Colombian families do a lot of social mixing. Most of the Clubs 700 members are Colombians, although many resident oil

This feature, one of a series describing important oil camps or cities throughout the world, is intended only to describe living conditions and to give a bit of the local atmosphere. While an occasional one of the features may touch lightly on working conditions, it will do so only incidentally.

Rooftop view of downtown Barranquilla shows oil facilities on the Rio Magdalena in the background. Here, at Colombia's main port, the broad river is the gateway to the interior. In the city are offices of half-dozen major concessionaires.

staffers belong—paying $1000 for membership.

Club "shares" are held by employes of International Petroleum (Colombia) Ltd. ("Intercol"); by families working for Colombian Petroleum Company ("Colpet"), Socony Vacuum and Texas Petroleum Company. And they, like the Jewells, live in the Prado.

"But," as Donald Bancroft, Intercol's Producing department manager said, "the average salaried oil family here can't afford to keep up with Colombia's high society."

Incidentally, it is quite a society. For Colombians are cosmopolitan, well-traveled, cultured.

Bancroft is a Texas A and M graduate who lives with his family (wife, a 13-year-old son, and a 5-year-old daughter in the Prado district. They have lived in South America since 1937, all but the last year and a half in Venezuela. The Bancrofts live in a four-bedroom home which has three baths and a big backyard. They pay about $25 monthly for a yardman, the same amount each to a maid and cook, both of whom live in. Most foreign oil staffers receive a monthly cost-of-living allowance.

In Barranquilla, the master bedroom, at least, should be airconditioned against 85-degree temperature and humidity, which sometimes climbs to 90 per cent. Still, tropical trade winds cool the city between December and April — when Barranquilla, according to Jewell, is at its best.

W. J. Jewell, area representative for Concesionaria de Petroleo Shell Condor, leaves his riverside office.

This storage yard near the Magdalena river belongs to Concesionaria de Petroleo Shell Condor. Oil activity in Barranquilla greatly accelerated in 1939 when the mouth of the river was dredged. Ships with 19-20 foot drafts now unload directly at the city's docks.

Twenty minutes from Barranquilla is Hotel Pradomar's pier and beach facilities on the Caribbean.

There is a short wet season during May and June, then a dry spell, then more rain during the long August to November wet season.

Corrosion is a very real problem, because of the salt-laden Caribbean trade winds. Shell, for example, built three new warehouses recently, all of them reinforced concrete. Older buildings—mostly steel construction—require the full time of six men to keep them in shape.

There is no trouble finding good schools for children, say the Bancrofts. Their daughter, Lennon, goes to a convent kindergarten; 13-year-old Rusty Bancroft goes to an English school.

"The parochial schools are first class," says their father. "Work the heck out of the kids."

Many petroleum youngsters attend the Carl C. Parrish school. Parrish is an American, and classes from kindergarten through the ninth grade are taught in English.

If oil families have any complaint—and few do—it is of the dearth of frozen foods and other imported items. Colombia is striving hard for self-sufficiency. This, by necessity, means curtailment of imports until her home industries mature. Bancroft admits he would like frozen foods now and then, but thinks Colombia's effort is well aimed—and necessary.

Income taxes—always an important subject for Americans abroad — run from 6-17 percent, payable annually, usually by February 28. Sometime during the year residents get a bill and are expected to pay within 90 days.

Bancroft directs his operations from Intercol's air-conditioned offices on the seventh and eighth floors of the Edificio Banco de la Republic, a modernistic building fronting Paseo Simon Bolivar, Barranquilla's principal business boulevard.

Social life, for the most part, is quiet. There are few night clubs or restaurants—not nearly as many as in Bogota or Medellin, Colombia's second city. But as everywhere in Colombia, society tends to be cultured, conservative and international.

Site of much of the city's social activity is Hotel Del Prado's spacious swimming pool.

Many of the Bancrofts closest friends are Colombians.

Like most Americans, he belongs to the American Men's Club which meets at noon, twice-monthly at various restaurants. Some feel that such clubs only preserve the expatriate's worst offense—his penchant for seclusion within his own circle of American friends.

Yet Barranquilla seems to be a "club town." The Club Aleman is for Germans; Club Alhambra, for Syrians; Club Union, Jewish; and a half dozen others. The Barranquilla Club is the city's oldest and most renowned.

There the heads of old Spanish families meet — their lineage going back to the early settlers.

Aside from the more formal types of clubs, there are organizations beckoning anglers, yachtsmen (at nearby Puerto Colombia) and kindred sportsmen. Biggest club of all is the Asociacion de Empleado Comercio, city-wide meeting place for employes, mostly those working in commerce and industry. No group holds more dances and parties than the Club Empleado Comercio.

Outside of business clubs, most society hubs around the swank Del Prado hotel, with its pool and grill, and the country club. Seventy percent of all social life here," says Bancroft, "is spontaneous. And most of it starts in someone's home."

Perhaps that is the very reason so many oil families like Barranquilla: Its spontaneity. Nothing artificial is found either in Barranquilla's citizenry nor in the town itself.

Carnival season starts in mid-January and ends on the Tuesday before Ash Wednesday. That is Barranquilla's big social fandango — much bigger than Christmas—and it's lively with dances, masked balls and sports events.

The real national sport is baseball — which draws tremendous crowds. Both Barranquilla and nearby Cartagena (population about 75,000) field two professional teams and import players from the States to fill out their clubs. Since Barranquilla's baseball season begins about the time the U. S. season ends, many baseball players merely catch the first plane south for Colombia. Barranquilla has hired players from Philadelphia and Cartagena from the Dodgers.

The nearby Caribbean is a fisherman's paradise, although some anglers prefer the lakes, just across the Magdalena. Hotel Del Prado operates a sister establishment, Hotel Pradomar, on the Caribbean beaches, only 20 minutes from town by bus Weekend at the Del Prado (minimum, American-plan, about $11 per person) and available is the use of the Pradomar's beach for free, although the Del Prado's big, fresh-water pool, set around with palm trees, is almost as appealing.

In this aerial view of the country club, tennis courts and clubhouse are easily recognizable. Most oil families live in this area of Barranquilla.

The country club stages annual tournaments on its 18-hole grass greens, and many big pros from the States compete for 17 cups and prizes totaling some $2500. The club also has a swimming pool, four tennis courts and a restaurant and bar.

From the air, Barranquilla lays flat and sprawling in a lowland rising just above the Magdalena's western banks. There is a bustling, international airport and a scattered but impressive industrial area (textiles, coffee processing, cigarettes, flour mills, factories producing perfumes, soaps, beer, oils, hats, shoes and pharmaceuticals).

Near the river is Barranquilla's modern downtown — big buildings, grassy boulevards, wide streets. And a scant ten minutes from downtown is the Prado district. But there is nothing unimpressive about the city's medium-income residential sections. Everywhere there are palm-lined streets flanked by cozy stucco bungalows, their painted walls alive with color. No two houses in Barranquilla, a visitor decides, are the exact same color, but reds, blues and greens predominate.

As in other major Latin American cities, Sears Roebuck maintains a big store as modern as any in the U. S. And you can buy a light car as easily as in the States (but heavier cars are hard to get because of import prohibitions based on weight).

Utilities are expensive, especially electricity. Oil families aren't surprised at a $25 a month light bill. But meat is relatively inexpensive. Where a light summer suit might be worn a couple of days in the States, Barranquilla's high humidity makes daily changing almost mandatory, but a pair of light duck trousers costs only $4.

Howard O'Mealy, an accountant for Texas Petroleum and a five-year resident of Barranquilla, says most oil families like to visit Colombia's other big towns — and there are lots of them.

"All this," an oilman said, "and also the siesta." He referred to Barranquilla's usual two-hour lunch break. For office hours are generally 7:30 a.m. to 11:30 a.m., 2 p.m. to 6 p.m.

Over their siesta coffee, Barranquilla's oil families were talking just as excitedly as their Colombian neighbors. For the big news was who would be selected among the country's Latin beauties for the title, "Miss Colombia."

The coming of oil, while greatly affecting Barranquilla's prosperity, certainly has not regimented its social thinking. —**The End**

Minas Field

Continued from Page 273

and personnel. Additional temporary prefabricated houses were ordered while studies were made in Europe of permanent types. The first houses were purchased in the Netherlands. Since then, more than 100 prefabricated senior staff type houses have been erected. In addition to the advantages of speedy erection with available labor, the houses have proven to be very comfortable.

Other than a limited amount of air freight, all imports are first shipped to Singapore, where they are temporarily stored or immediately transferred to lighters or river freighters for transport across the Malacca Straits and over 100 miles up the meandering Siak river to Rumbai or Pakanbaru. The problems of scheduling such movements and arranging for offloading at Rumbai with the meager facilities available in 1949 and early 1950 were tremendous. Tons of materials had to be stored in company-owned and rented barges until adequate warehouse facilities were constructed.

Construction forces began arriving in mid-1951. Houseboats were built in Singapore to take care of the crews at the ocean and river terminals, and the main construction camp was established near the site of the Central Pump Station in the Minas field. Thousands of tons of materials were brought up the Siak River and trucked an average of 30 miles into the jungle.

Under this heavy traffic, maintenance of the oil surfaced roads became a formidable task. On occasions during exceptional heavy rains, tractors were stationed at bad spots to keep the materials moving. At Pakning, the site for the ocean terminal, the engineers had a bottomless swamp to contend with and devised a small railroad with tracks floating on corduroy to handle materials until a serviceable road could be built.

Local labor was limited and large groups were brought in from other areas of Sumatra. The dry season which is normally the three months of June, July and August, was unusually short and the rest of 1951 and first part of 1952 were extremely wet. The availability of materials and heavy equipment on the world market was limited and handling facilities from Singapore to the site were poor. Despite these difficulties, the first crude was pumped down the 17-mile pipe line to Perawang in April, 1952. Since then the oil transport system has been expanded to all points to handle increased quantities.

Production, exceeding 40,000 barrels a day for the past two years and now running about 65,000 barrels a day, is pumped through a 12-inch 17-mile pipe line to a river terminal, Perawang, on the Siak river. A fleet of six specially designed, 24,000-barrel river tankers move the oil to a marine terminal, Pakning, at the mouth of the Siak river, from whence it is lifted by ocean-going vessels.

The company maintains a development drilling program in the Minas field and an active exploratory program seeking additional reserves. These primary activities are supported by the manifold service and community facilities essential to the development and production of oil in isolated areas.

Minas crude has an average gravity of 35.5° API, a true wax content of between 21 and 25 percent by weight and a pour point of 95°

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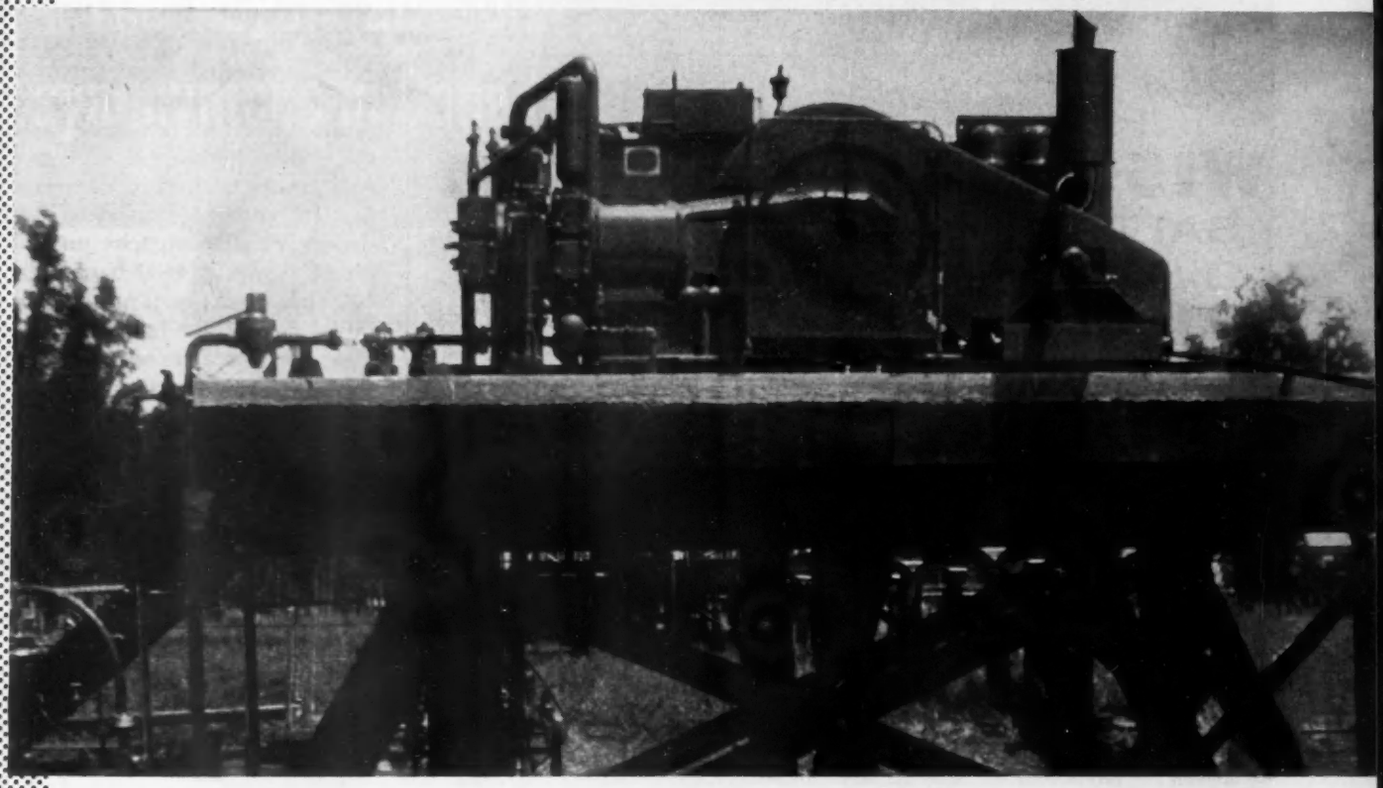

An installation of a Wilson Supply-Ingersoll-Rand Packaged, Portable Compressor in the overflow portion of the flood control area of the Atchafalaya River in Louisiana.

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F. From the wellhead, the crude is either pumped or flows at a controlled rate through a gathering system composed of 3½- and 4-inch lines to the tank batteries, thence directly into the Central Pump Station. Although many of the wells flow, individual pumps are used to keep the tubing pressures low. Back pressure of 15-20 pounds per square inch is maintained on the traps. The crude has a gas-oil ratio of less than 100 cubic feet per barrel. The temperature of the crude at the wellhead averages around 135° F., while bottom-hole temperatures at about 2600-foot depth are around 200° F.

Seven gathering stations are now operating and from these the crude is pumped to the Central Pump Station through 6-inch uninsulated, surface lines which vary in length from 1000-8000 feet. With an ambient temperature of about 75° F., the crude arrives at the Central Pump Station at 96-103° F., or at an average of approximately 99° F., when all batteries are pumped simultaneously into this station.

At the Central Pump Station there are three 55,000-barrel and two 80,000-barrel storage tanks. All royalty gaging is performed there before the oil is pumped through the 12-inch pipe line 15.5 miles to Perawang tank farm, approximately 1.6 miles from the Siak river. Each tank at the Central Pump Station is equipped with internal heat-exchange units designed to raise and maintain the crude at 105° F. temperature.

The pipe line pumping equipment consists of five diesel-engine-driven reciprocating pumps, designed to pump 11,500 barrels daily each at a differential pressure of 1200 psi. with four in operation and one on standby. In addition, an electric-motor-driven, variable capacity pump capable of pumping 4400 barrels daily at 1200 psi. discharge is provided to start initial flow on the line, if necessary.

At the Perawang terminal there are three 80,000-barrel storage tanks. The crude arrives here at a temperature of approximately 85-88° F. and is again heated and pumped to tankage. Four steam-turbine-driven rotary pumps load the crude. When loading, the crude is pumped through a 16-inch line, extending for 1.6 miles from the tankage across the swamp, to a loading pier.

To turn the river tankers around in the Siak at this point, a turning basin had to be dredged opposite the pier area.

Six specially constructed shallow-draft river tankers, each with a capacity of approximately 24,000 barrels, shuttle the crude from Perawang 93 miles down stream to the marine terminal at Pakning on the Strait of Bengkalis. A limitation in the draft of these vessels is due to the bars at the mouth of the Siak.

At Pakning terminal seven 142,500-barrel storage tanks are used. In this swampy area, the tanks are supported on ten-inch concrete mats resting on Douglas fir piling. There are approximately 1000 piles up to 70 feet in length under each tank.

The T-shaped wharf is 900 feet long and is reached by a 700-foot approach trestle. Twenty-inch steel piles ranging up to 150 feet in length were used for this wharf. Cathodic protection has been installed recently to combat corrosion, with results yet to be ascertained.

Water depth at the pier (55 feet

Another

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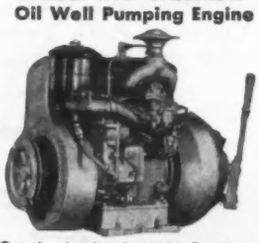

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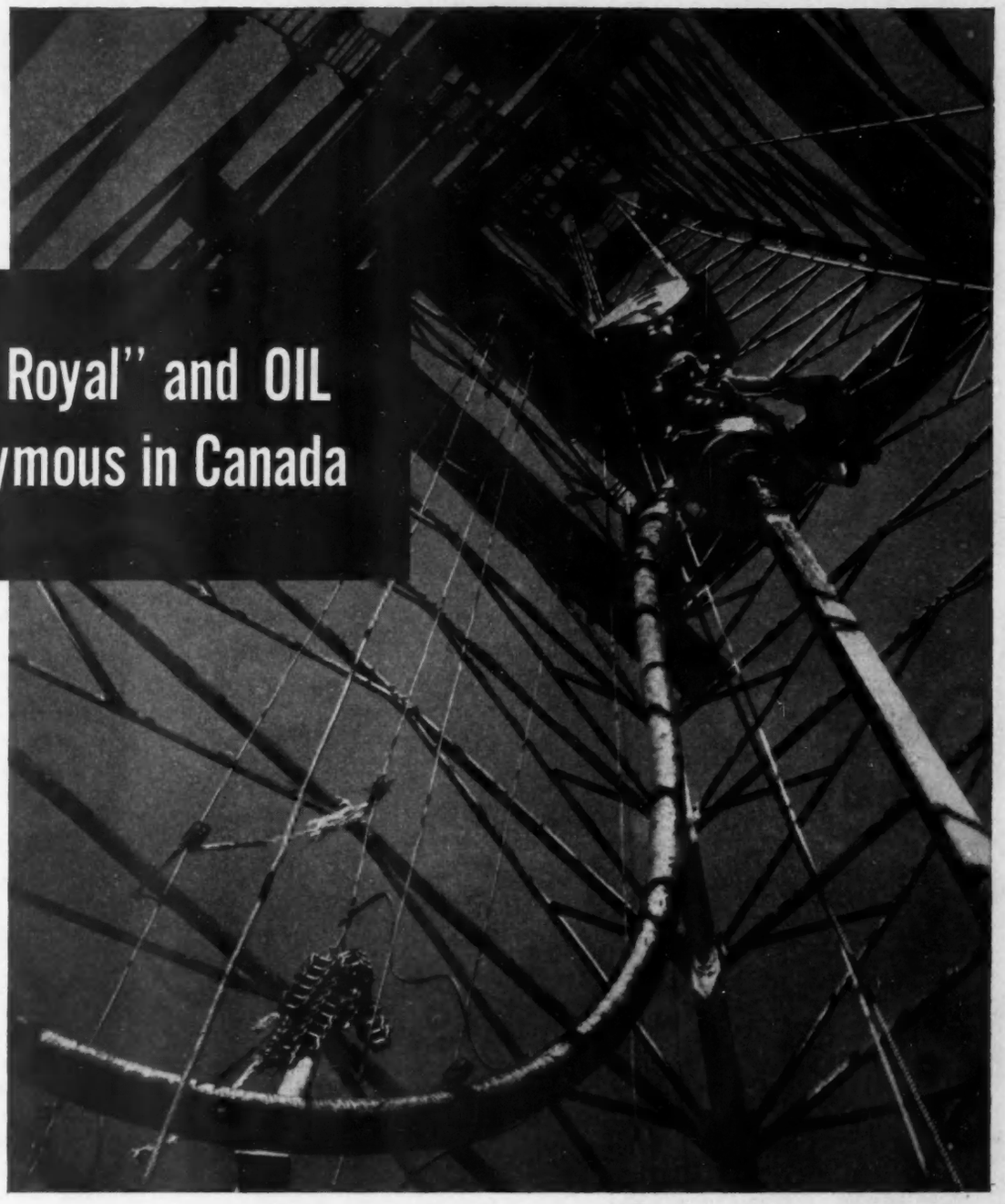

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The Royal Bank issues bulletins from time to time covering statistics, regulations, tariffs, oil and gas financing, and kindred subjects. These are free on request. For a list of current bulletins write to The Royal Bank of Canada, Oil and Gas Department, 409 – 8th Avenue West, Calgary, Alta.

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Prefabricated homes were built as temporary quarters to be replaced by permanent homes for employes at Caltex Pacific's Rumbai camp in central Sumatra. This camp, about 20 miles from the main production camp of Minas, currently houses more than 350 families.

at low tide) is sufficient to permit the handling of the largest supertankers. Simultaneously, two shallow-draft tankers may be accommodated on the inside of the wharf, unloading, while the largest tanker may be loading on the outside.

To support the basic producing operation in Sumatra, a net work of roads has been constructed in order to drill and produce the wells, lay and maintain the pipe lines and to service the camps. This road net now exceeds 200 miles. In addition, more than 100,000 square feet of warehousing and shops have been constructed and almost 3000 kilowatts of generating capacity placed into operation.

A major camp has been constructed at Rumbai, almost two miles down river from Pakanbaru. This camp houses more than 350 families, with more new homes under construction. About two-thirds of the homes are occupied by Indonesian employes and the balance by expatriates. In addition to this community, the main production camp of Minas, about 20 miles away, houses another 400 families. Other smaller communities exist at Perawang, 20 miles downstream from Rumbai, and at Pakning which lies at the mouth of Siak.

The circumstances of operating in an undeveloped area have necessitated the establishment of large service groups which include a medical staff with a 50-bed, fully-equipped hospital; teachers with their academic and industrial schools; accountants; a personnel administration group; a purchasing and warehousing organization; engineers; public and government relations groups; utility operators; maintenance forces and camp administrators.

Rapid growth of the enterprise is indicated by the number of temporary structures still in use, while an accelerated building program is in progress. In fact, the growth has been so rapid that even local food supplies cannot meet demand. As a result, most food stuffs, including rice, must be imported. However, local suppliers are increasing stimulating local enterprise, and relieving Caltex of some of the burden.

By far the greatest number of Caltex Pacific's employes are in the service group category. The actual drilling and producing operations require these auxiliary functions in order to work efficiently. Almost all the residents of Rumbai, the main camp, work in these service groups, the greatest number being office workers. An air-conditioned administration building is in the design stage to accommodate these employes, who for the past three years have conducted office functions in temporary quarters. Other employes are in the shops, warehouses and maintenance crews.

A sizable bus system transports them to and from their jobs. This

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barrels, or 2184 gallons a minute. Surface working pressure was 3400 pounds per square inch.

The well which received this record-breaking treatment was completed at 7767 feet for a good flow of oil in 1953. Its production declined characteristically, and it was pumping 27 barrels a day when taken off production for this treatment.

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Here is the "working area" for the record fracture job. In the foreground is one of two blender trucks which mixed the water and sand. In the center is a sand truck. Tanks which held the water are at left. Dowell's remote-controlled, Allison-powered pumpers are shown at right.

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transit system operates much like a bus company in any small town. Since approximately 1600 of the Indonesian workers still live in Pakanbaru, a regular river ferry schedule is maintained in conjunction with the bus system in order to provide adequate transportation for this group.

Progress made by the company would have been impossible without the adaptability of the Indonesian employes in learning new skills. Not more than a handful had even a vague knowledge of heavy machinery or oil production. Now, after less than five years, Indonesian personnel have learned to handle almost every piece of equipment, have achieved foreman status in the producing operations and have done equally as well in other departments. Some of Caltex's more recent wells have been drilled by all-Indonesian drilling crews.

Training of personnel has had to be accomplished on the job. The supervisors in each phase of work usually started with laborers or, in some instances, with men who had some knowledge of building trades. Excellent draftsmen have been trained in this way, without having had prior specialized schooling, and even some surveyors have been similarly trained.

However, in the last few years, Caltex has also established formal training schools. Full time instructors have been employed and they are augmented by the part time assistance of employes. This school organization is still young, but plans have been made to increase the curriculum in order to prepare employes for higher positions.

The fact that the company must engage in many activities other than the finding, lifting and transport of oil has a broadening effect upon its American and European employes. They are expected to assume larger and broader responsibilities than in an equivalent job in the U. S. Even the most specialized employe is expected to devote time to the training and growth of Indonesian workers.

Due to the remote location of Rumbai, frequent trips to any place but the small village of Pakanbaru are inconvenient. Although an occasional flight to Djakarta, Medan or Singapore can be made and an interesting excursion is possible by car to picturesque Bukit Tinggi, a pretty town high in the mountains west of Pakanbaru, local sports and amusements must

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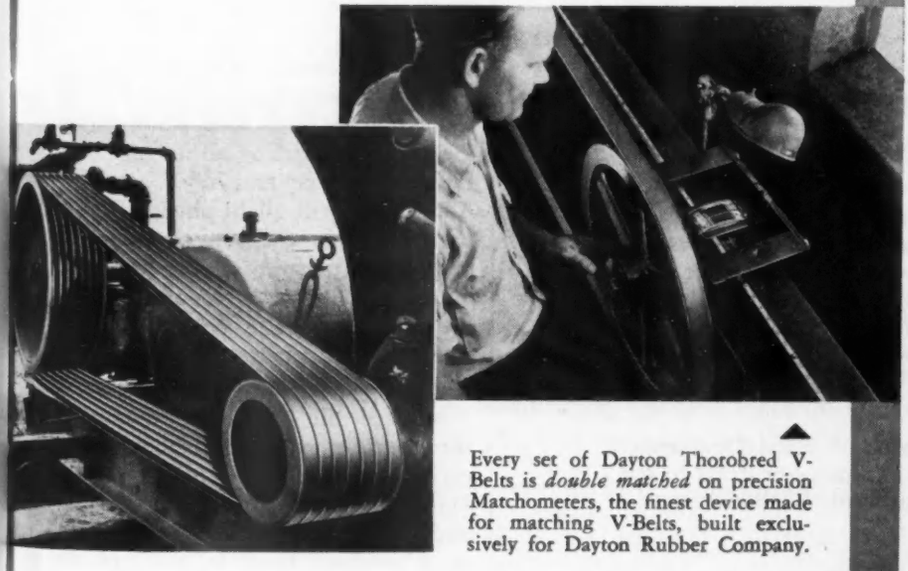

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take the place of the activities that are available to people in more developed parts of the world. The investment in adequate recreational facilities, though sizable, is essential as a morale factor.

For the more adventuresome, big game hunting is available to those interested. Most hunting is done at night with the aid of a miner-type head lamp.

Social activity forms an important part of camp life and, naturally, becomes more formal as the operation leaves the pioneer stage. In the early postwar period, the Rumbai club consisted of one small room with a veranda, a bar and a record player.

Now Rumbai has a substantial club with tennis and badminton courts, billiards, movies and library. A swimming pool has recently been completed and a larger club house is nearing completion. The club board organizes sports and entertainment programs.

Tennis, softball and soccer leagues are very active and the Caltex softball team is presently the champion of the Indonesian league.

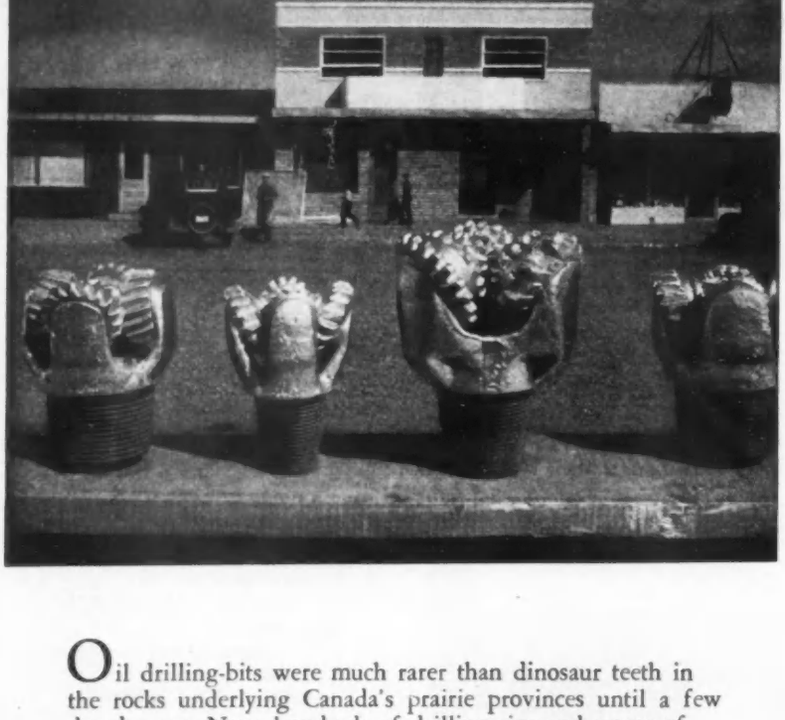
Situated within 35 miles of the equator and with less than 200 feet elevation, one would normally expect Rumbai, with its rainfall of 120 inches per year, to have an unbearable and humid climate. However, the high ceilinged, well-ventilated houses are reasonably comfortable during the hottest days.

At night, most people find it cool enough to use a light cotton blanket. Temperatures vary little throughout the year, maintaining an average 82° F. during the day and 75° F. at night. Admittedly, with slight physical labor, particularly in the sun the average person will perspire heavily and definitely feel the heat. A walk through the jungle, which is very dense and almost never penetrated by sunlight, will produce a steambath effect.

Modern oil companies operating abroad fully understand that many varied responsibilities must be assumed along with the job of finding and producing oil. This is nowhere more evident than in the remote jungle location of Central Sumatra, where the oil community was built and is now sustained by the common effort and constant cooperation of the oil producing company and the citizens of that part of Indonesia.

—The End

Teeth that bite deep in Western Canada



Oil drilling-bits were much rarer than dinosaur teeth in the rocks underlying Canada's prairie provinces until a few decades ago. Now, hundreds of drilling rigs and scores of refineries are capitalizing on the wealth that lies far below ground in Western Canada.

As a pioneer bank in Canadian oil, The Canadian Bank of Commerce will be glad to help you in any activities in which your own firm may be engaged—or may contemplate undertaking—in Canadian oil. We have more than 150 branches in the Sedimentary Basin, and a fully equipped Petroleum and Natural Gas Department located in Calgary, under the management of men of long experience in Canadian oil.

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a WORLD of OIL

By **DON KLIEWER,** World Oil Staff

ABU DHABI: An offshore drilling platform has been ordered by The British Petroleum Company, and is expected to be completed by May, 1957, for an offshore test near the small island of Das 60 miles off the coast of the Abu Dhabi sheikhdom.

AFRICA: The first well to be drilled on Zanzibar Island off the East coast of Africa was spudded in May by British Petroleum and Royal Dutch Shell. The test was projected to 12,000 feet.

AUSTRIA: The Mineral Oil Administration reportedly will spend $9.2 million during 1956 to maintain annual crude production at 24 million barrels. The drilling program calls for 157 wells during 1956, including 116 field wells, 27 extensions, and 14 wildcats. Austria exported 8.1 million barrels to Russia through June and was slated to deliver 678,800 more barrels by July 27 to complete the reparations quota for 1956.

CANADA: Successful exploration for gas on the Bald Mountain anticline on Gaspe Peninsula in Quebec has been reported. A well blew wild after shooting at 6605 feet and registered 1350 pounds at the surface after being placed under control, a Gaspe Oil Ventures, Ltd., report said.

DHOFAR: Dhofar-Cities Service Petroleum Corporation has abandoned a second wildcat test in Dhofar, located 80 miles southeast of Wadi Dauka. The test had a slight oil show at 1800 feet and was drilled to 8000 feet before being plugged. The rig was being moved 25 miles due north to the third location.

HOLLAND: An encouraging gas show was reported in a wildcat drilled at Ijsselmonde, on the south bank of the Maas river in Western Holland, about six miles from Rotterdam. Operator was NAM.

HUNGARY: The Hungarian Communist Party newspaper Szabad Nep. was quoted by Reuters as having said the Nagylengyel oil field, which produced 60 percent of the nation's crude yield in 1955, has been ruined by overdrilling and producing. Water encroachment has become serious, though the field is only five years old.

IRAN: The Iranian Consortium reported July, 1956, production in South Iran at 593,000 barrels per calendar day . . . Average daily refinery throughput during the same period at Abadan was 241,000 barrels per calendar day.

IRAQ: Iraq Petroleum Company, Ltd., reportedly paid Iraq more than $100 million during the first half of 1956 in oil revenues. Second quarter payments were said to exceed those in first quarter by more than $3 million . . . Iraq law automatically allocates 70 percent of the state's oil revenues to development projects.

JAPAN: A Prakla Gesellschaft crew from Hannover, Germany, began

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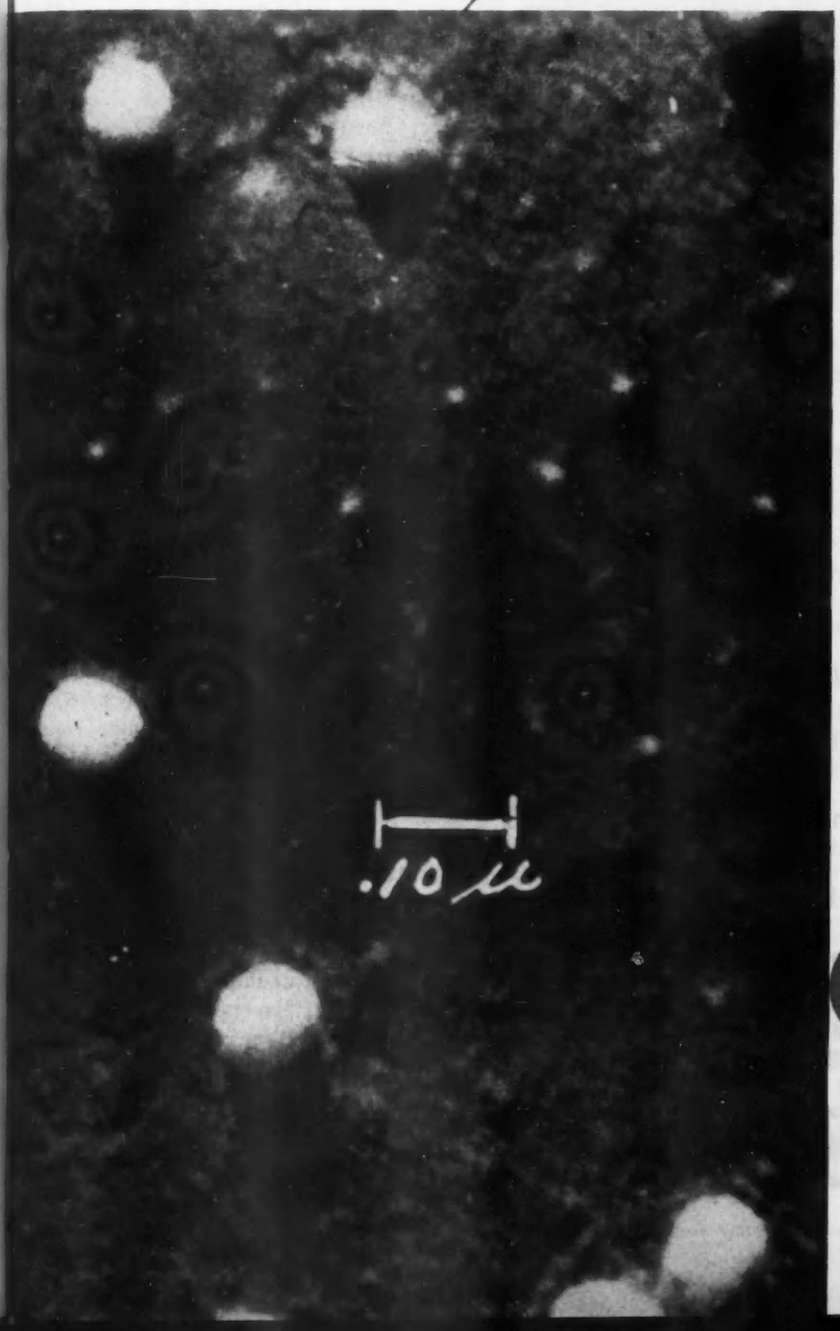

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seismic surveys in August per agreement between the Japan Petroleum Exploration Company and Prakla. The German team, which was used first near Nagaoka in Niigata province on Honshu island, will continue operations for a year . . . The Nikko Maru, a 32,000-deadweight ton tanker, was delivered in Nagasaki, Japan, to Tokyo Tanker Company, a Caltex group member, on August 27 after completion of sea trials. The vessel will deliver Persian Gulf and Sumatran crude to Japanese refineries.

KUWAIT: Kuwait Oil Company, Ltd., announced crude production in Kuwait for July, 1956, at 37,345,173 barrels, or 1,204,683 barrels daily. Production in June was 34,594,001 barrels, or 1,153,133 barrels daily. Crude production during July, 1955, was 35,702,521 barrels, or 1,151,694 barrels per day.

MIDDLE EAST: Jordan, Syria and Lebanon were said to have agreed in principle August 27 on "equal shares" in their negotiations with Trans-Arabian Pipe Line Company as to payments to these governments pursuant to Tapline's profits. Trans-Arabian has offered to split profits 50-50 between the company and the four states through which the line runs—Saudi Arabia, Syria, Jordan and Lebanon. Saudi Arabia was not represented but was reported willing to go along with agreement complying with this principle . . . Details of the agreement, to determine the exact shares the four governments would receive, are yet to be resolved.

NEW ZEALAND: The British Petroleum Ltd. interests will form an exploration company jointly with Todd Brothers to prospect the East coast of North Island, New Zealand. The area involved will include the districts of Gisborne, Hawkes Bay and Wairarapa. Both companies represented in the new firm have prospecting licenses in this area . . . BP continues its oil search through BP (Oil Exploration) Company of New Zealand. In addition, exploration through a joint BP-Todd Bros.-Royal Dutch Shell combine, Shell D'Arcy and Todd Oil Services Ltd., continues in New Zealand.

PAKISTAN: Pakistan Petroleum Ltd. has spudded in a test well at Drigh Road, near the main highway from the Federal Capital to Karachi airport . . . Gas samples from Sylhet 2, Pakistan Petroleum's deep test in East Pakistan, were being analyzed as the well neared the 7000-foot level . . . Pakistan Oilfields Ltd. has spudded in a well at Jhatla, in Campbelpur District, West Pakistan . . . PPL has scheduled a new test well in the Indus valley at Khairpur . . . The government and Shell Company of Pakistan Ltd. have signed a pact for the formation of a new company, Pakistan Shell Oil Company Ltd., to search for oil in both wings of Pakistan . . . Pakistan Petroleum Ltd. and Pakistan Oilfields Ltd. were preparing to drill a deep test at Adhi, 28 miles from Chakwal town in the Jhelum District of Rawalpind Division.

PAPUA: Australasian Petroleum Company has made a new location for a deep test in Papua, at Barikewa, in the Kikori River valley. Another drillsite selected near the Morehead River in southwest Papua, about 30 miles inland.

TURKEY: Future plans by Bolsa Chica Oil Corporation and its associates in

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Turkey are awaiting completion of a survey, begun in May, evaluating 612,000 acres under license.

VENEZUELA: Five more concessions, totaling 42,672 acres of government reserve land in Lake Maracaibo, have been granted Mene Grande Oil Company, Cia. Shell de Venezuela, Superior Oil Company, Venezuelan Leaseholds C. A., and Venezuelan American Oil Independent Producers Association, Inc. . . . More concessions which will include non-government reserve lands and areas other than Maracaibo reportedly will be granted shortly.

WEST GERMANY: Schwedeneck 7, a Wintershall-DEA consortium wildcat east of Eckernfoerde town near the Baltic coast, has struck oil at about 5000 feet to open up the northernmost oil area in the country . . . In July, monthly crude output amounted to 2,134,644 barrels for the first time . . . The consortium of companies interested in the projected North Sea-Rhine pipe line were scheduled to meet this month.

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Remote Iranian Wildcat Reportedly Major Gusher

A National Iranian Oil Company wildcat at Qum, 75 miles south of Teheran, reportedly was gushing oil up to 200 feet in the air and flooding the surrounding desert area. The flow was estimated at 80,000 barrels daily, which would be the nation's biggest producer. Assistance in capping the well and preventing fire was requested of the Iranian Consortium, and was reported en route.

The well was brought in on August 27. Qum is 200 miles northeast of Lali field, the nearest production, and would be in an entirely different geological province from previous Iranian production. Qum also is 325 miles east and slightly north of Naft-I-Shah field on the Iraq border and about the same distance southeast of Russia's Old Baku oil fields.

Union Oil Brings Major Costa Rica Find

With a well flowing at an estimated rate of 1000 barrels a day, Union Oil Company of California has made "an oil discovery of tremendous importance in Limon province, Costa Rica," according to A. C. Rubel, president.

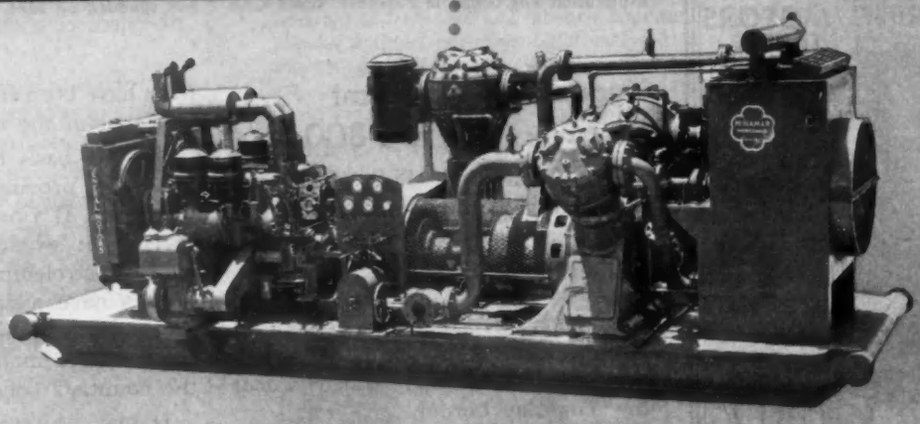
This is the first commercial oil discovery in Costa Rica, where Union Oil has a 3.5-million acre concession adjoining a concession of an additional 350,000 acres directly across the border in Panama.

On the first of two formation tests, Union's discovery well, Cocoles 2, flowed 46 gravity clean oil at the rate of between 200 and 500 barrels a day; on the second test the well flowed at the rate of 1000 barrels a day with high pressures. The company was running casing to complete the well which reached a total depth of 4950 feet.

Cocoles 2 was drilled after Cocoles 1 showed traces of oil. The well is located about a half mile from the northeast border of Panama and is about 16 miles by road from the Caribbean coast. Drilling in the Panama concession was scheduled to be undertaken immediately.

Earlier, in San Jose, Costa Rica, Stanley Martin, Union Oil official, had described the Cocoles 2 as having "excellent shows of high quality with good pressure at 4900 feet."

proven in the field!



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Stanolind's First Exploratory Test in Jamaica

This is the drill site of Jamaican Stanolind Oil Company's first exploratory test in Jamaica. Located on Santa Cruz Mountain 2650 feet above sea level, Santa Cruz 1 is situated near the edge of a plateau that drops steeply over 2000 feet to the coastal plains below. A 260-foot water well on the coastal plain three miles distant and about 2000 feet lower than the drilling site supplies water for drilling. Latest report from the location said the well was drilling ahead below 4500 feet in limestone and chert. Jamaican Stanolind is a wholly-owned subsidiary of Stanolind Oil and Gas Company. Jamaican Stanolind has prospecting licenses on the entire land area of Jamaica and on offshore submerged lands to an average distance of 12 miles. Surface exploration was begun in February. Santa Cruz 1 was spudded on June 3.

Yugoslavian Wildcat Discovers Gas at 7800 Feet

A wildcat well, Fi-2, drilled by Proizvodnja Nafte Lendava, has discovered at 7800 feet a sizable natural gas supply in northwest Yugoslavia. The location is about 25 miles from the former MAORT [an affiliate of Standard Oil Company (New Jersey)] fields in Lovaszi, Hungary, near the Yugoslav border.

Private sources have informed WORLD OIL that the well, when it blew out of control, produced natural gas at the rate of 17 Mmcf daily—the largest producing rate of any Yugoslavian gas well. After several hours, the well was brought under control and was prepared for further perforating.

The entire region near the new discovery has been studied by gravimetric and seismic crews. Nafta Lendava has speeded its efforts in locating new sites for wildcats. Previously, two wells had been completed in this area—one found an unreported amount of natural gas, the second was a dry hole.

It is believed that oil may be found lower on the structure and that Well Fi-2 has penetrated the gas cap. To determine this, sites for two more wells have been staked to the east and southeast of the discovery well.

On the basis of present information, the province's future appears promising. If a new oil field were discovered, it would rejuvenate Yugoslavia's petroleum industry whose refineries have a capacity considerably greater than domestic crude production which is unable to keep pace with the country's consumption.

It may be recalled that Manat, a Hungarian-German company, drilled two dry wildcats about six miles west of Fi-2 in 1942 and 1943. As indicated by present information, Manat's wells were too high on the structure.

About 12 miles southeast of Fi-2, Onart, a German-Italian company, found in 1943 a small reservoir of 39-gravity crude and large quantities of natural gas. After the war, the field was developed and total cumulative production amounts to 2.7 million barrels.

In addition, several fields east of Zagreb operated by Nafta-Plin-Zagreb produced a total of 1,417,300 barrels of oil in 1955. This year, production from them is expected to climb to more than 1.6 million barrels.

Fields north of Beograd, operated by Nafta-Gas-Novi, are expected to produce about 135,000 barrels of oil

during the next year, in addition to a large quantity of natural gas.

In Montenegro and northern Bosnia, extensive wildcatting operations are being conducted by Crna Gora-Petrovac and Nafta-Pozarnica.

Most of the equipment and material for drilling and producing operations is imported from the U. S. Other sources are Germany, Italy, Russia, and Great Britain. Various types of equipment and materials are being manufactured domestically, such as derricks, storage tanks, separators, gasoline plants, line pipe, and at the close of 1955 some wells had been put into production with domestic casing.

2525 Attend Geological Congress at Mexico City

A total of 2525 members, representing 131 countries, attended the 20th International Geological Congress held Sept. 5-11 at Mexico City. The Congress membership roster includes 4039.

With the U. S. accounting for the largest number of members attending, 20 countries furnished 43.9 percent of the attendance. These countries and the number of member delegates from each follow:

U. S., 1126; Mexico, 398; France, 144; Canada, 109; U. S. S. R., 85; West Germany, 50; Venezuela, 48; Great Britain, 47; Italy, 38; and Algeria, 29.

Most of Latin-America Being Mapped by U. S.

A little-known, huge-scale program with wide implications to the development of Latin America is being conducted in all Latin American countries except Argentina, Paraguay and Uruguay. The U. S. Army Corps of Engineers, through its specially-created American Geodetic Survey, has completed aerial photography of about 20 percent of the area of the 17 countries, and plans to see the job through to completion.

Maps are being compiled by the Corps of Engineers for exclusive issue to the countries concerned. Some U. S. commercial firms are working on the project under contract with the Army May Service. The U. S. pays $2.5 million annually for the project, while participating countries pay $10 million.

Reduce your Production Costs
two important ways!...

Fitted with a flexible and resilient ball guide, the PACIFIC Patented* API Ball Valve Cage lowers your production costs by—

1 **Extending the use life of ball valve and cage.**

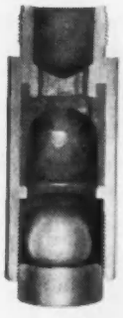
2 **Extending the runs between pulling the pump to replace worn valves, seats and cages.**

Why a flexible, resilient Ball Guide?

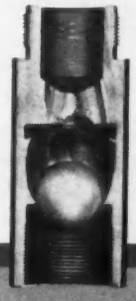
The difference in the capability of a resilient and a rigid material to absorb repeated shocks without permanent deformation is shown graphically by the unretouched photographs below. The ball valve cages are from the same pump.

HERE IS THE ANSWER:

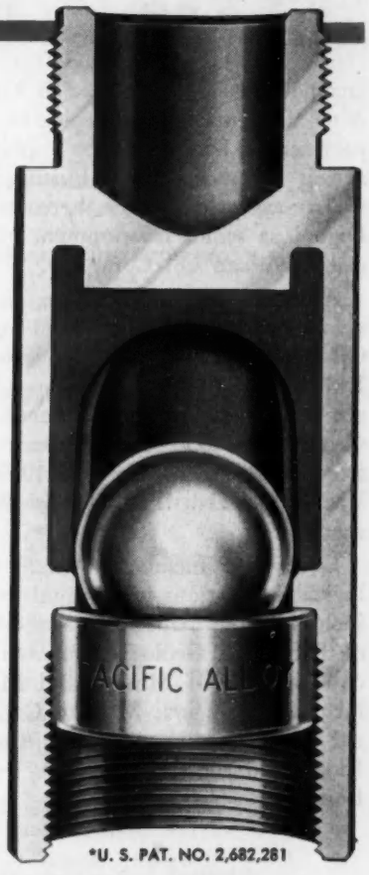
The PACIFIC steel ball valve cage, with a flexible, resilient ball valve guide bonded to the cage, *costs no more* than a standard steel ball valve cage, *yet it will give three to four times the service.*



A PACIFIC steel ball valve cage fitted with a flexible, resilient ball valve guide retains its original shape after 182 days of continuous operation. The ball valve is in good condition and may be easily removed from the cage.



A standard steel ball valve cage with hardened steel ball valve guides permanently deformed after 49 days of continuous operation. The ball valve cannot be removed from the cage.



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DW16

What's Happening

AMONG WORLD OIL MEN

E. V. CORPS, exploration manager, Pakistan Petroleum, Ltd., has retired after 26 years of oil industry service in the East. He left Karachi on September 11 for the United Kingdom.

E. V. Corps

Corps, who has been manager of PPL, joined Burmah Oil Company in 1930 as a geologist, being headquartered in Yenangyaung, Burma, and later in Digboi oil field in Assam. After 10 years in the Geological department at Digboi, he was appointed acting senior geologist, Burma, and was re-assigned shortly thereafter to Digboi as senior development geologist of Assam Oil Company.

After a year in Pakistan as development geologist of The Burmah Oil Company (Pakistan Concessions) Ltd., he returned to Digboi as acting senior geologist for the Burmah Oil Group from 1950 to 1953. On return from leave at the close of 1953, he was appointed PPL's exploration manager.

Corps is a member of many geological institutions and organizations, including the American Association of Petroleum Geologists; the American Institute of Mining and Metallurgical Engineers; Mining, Geological and Metallurgical Institute of India; and the Geological Society of London.

•

I. G. DAVIS, formerly vice president, Mene Grande Oil Company, Venezuela, has been elected president of the company, succeeding HOYT SHERMAN, who has retired. C. W. PEERY, formerly manager of Operations, has been elected vice president.

Davis, who received a degree in geology from The University of Texas in 1929, gained wide experience in oil field geological work in Michigan and Texas before accepting a position with the Gulf Research & Development Company in 1935 as a geologist and geophysicist assigned to Venezuela. In 1939, he transferred to the Geological department of Mene Grande at Maracaibo, and the following year he was moved to Caracas. Davis returned to Maracaibo in 1946 as assistant manager of the Western district. Two years later, he was made Western district manager the position he held at the time of his most recent promotion.

Sherman, a Harvard graduate, went to Maracaibo as assistant general agent for Venezuela Gulf Oil Company in 1930, and transferred in 1937 to Mene Grande as general manager. He was moved to San Tomé in 1939 and placed in charge of the company's Eastern Venezuela development operations. In 1947, he was elected vice president, with headquarters at Caracas. In 1949 he became president.

Peery joined Gulf Oil Corporation in 1934 and was sent to Eastern Venezuela as a geologist, transferring to Mene Grande in 1937 as a petroleum engineer. In 1939 he became chief petroleum engineer, and in 1940 became assistant superintendent of the Production department at San Tome. After serving with the Marines during World War II, Peery returned to his position, and was named assistant general superintendent in 1948. He was promoted to general superintendent in 1949, and in 1951 was named Eastern division manager. In 1955 he was transferred to Caracas as manager of Operations. As vice president, he will remain in Caracas.

•

At a recent meeting of International Petroleum Company, Limited, stockholders in Toronto, Ont., Canada, the following were elected directors:

I. R. CUNNINGHAM, M. L. HAIDER, W. C. KIRKPATRICK, R. H. MILBRATH, J. K. OLDFIELD, G. E. WAGONER, J. J. WAYBRIGHT, and O. C. WHEELER.

At a meeting of the board of directors in Coral Gables, Fla., later, the following were elected or appointed officers:

M. L. HAIDER, president; I. R. CUNNINGHAM, O. C. WHEELER and R. H. MILBRATH, vice presidents; C. R. CHAPMAN, secretary; G. R. WALKER, treasurer; C. J. MILLAR, comptroller; G. M. CROOKSTON, assistant secretary; and A. H. NIMMO and L. V. CHARLESWORTH, assistant comptrollers.

•

JOHN W. GENDRON of Tide Water Oil Company has been elected president of Iricon Agency Ltd., succeeding R. S. STEWART, vice president of the Standard Oil Company (Ohio).

J. W. Gendron

Iricon is the organization established to represent the 5 percent interest in the Iranian Consortium held by American Independent Oil Company, Atlantic Refining Company, Getty Oil Company, Hancock Oil Company, Richfield Oil Corporation, San Jacinto Petroleum Corporation and Signal Oil and Gas Company, as well as Standard of Ohio and Tide Water.

Stewart has become a vice president of the agency after serving as its first president under an Iricon policy of rotating executive posts among officials of member companies. Gendron will continue as manager of Tide Water's Oil Purchase and Exchange department in addition to his responsibilties with Iricon.

Other newly elected officers include L. C. BERGQUIST of Iricon's London office, vice president; DAVID E. DAY of Richfield, vice president; J. J. SHREWSBURY of Hancock, treasurer; S. K. McCAULEY of Atlantic, assistant treasurer; RAYMOND W. ICKES of Aminoil, assistant secretary.

Tapline Expansion Program To Be Completed in 1958

Completion date of January 1, 1958, has been scheduled for the program undertaken by Trans-Arabian Pipe Line Company whereby four auxiliary pumping units will be installed to increase the Tapline's throughput by about 90,000 barrels daily. The new units will be installed at points in Saudi Arabia and Jordan.

They will be auxiliaries to the main pumping stations at Qaisumah, Rafha, Badanah, and Turaif in Saudi Arabia. The pumps, which will be located about midway between stations, each will be driven by 5000-horsepower gas turbines.

The units will be unattended, their operation being controlled by radio from the main pump stations. Total pumping facilities of the line which links Saudi Arabia with Lebanon, are expected to handle about 410,000 barrels of Saudi Arabian crude daily.

Arabian American Oil Company, Saudi Arabian concessionaire, was planning to install pumping units downstream from Mariyah and Qatif Junction.

Upper Austrian Exploratory Test Discovers Oil

The exploratory well, Puchkirchen 1, drilled by Rohoel-Gewinnungs-AG about 30 miles northeast of Salzburg, between the villages of Redl and Attnang, has struck an oilbearing horizon of the Lower Oligocene at a depth of 8468-8475 feet.

Production tests yielded a flowing rate of 312 barrels a day of light crude.

Duetsche Erdoel Brings In 350-Barrel Daily Producer

Deutsche Erdoel A. G.'s exploratory test—Leiferde 1—located about five miles southwest of Gifhorn, near Leiferde village, has discovered oil at a depth of 2700-2736 feet. Initial production tests indicated a flow of 350 barrels a day.

The discovery is south of exploratory wells drilled near Hardesse-Harsebruch years ago, on a structure located by seismic surveys and limited by a system of faults in the east which connect the salt domes of Gifhorn and Rolfsbuettel-Hillerse.

Cataract Acquires Oil, Gas Concessions in Panama

Cataract Mining Corporation of New York has acquired more than 2 million acres of oil and gas concessions in Panama. The larger part of the concession is located in Chiriqui province alongside the Costa Rican border and is part of the area where Union Oil brought in its recent discovery well. Drilling operations were scheduled to begin shortly.

It was reported that at least 15 major oil companies were seeking or already had acquired concessions in Panama. Cataract's concessions were acquired by Compania Catarata de Petroleo Panama, S. A., a wholly-owned subsidiary of Cataract of New York.

Panama's geology is similar to the sedimentary basin productive in Mexico. The geological data compiled in the 1920s and 1930s by Sinclair interests at a reported cost of $2 million is being made available by Panama sources.

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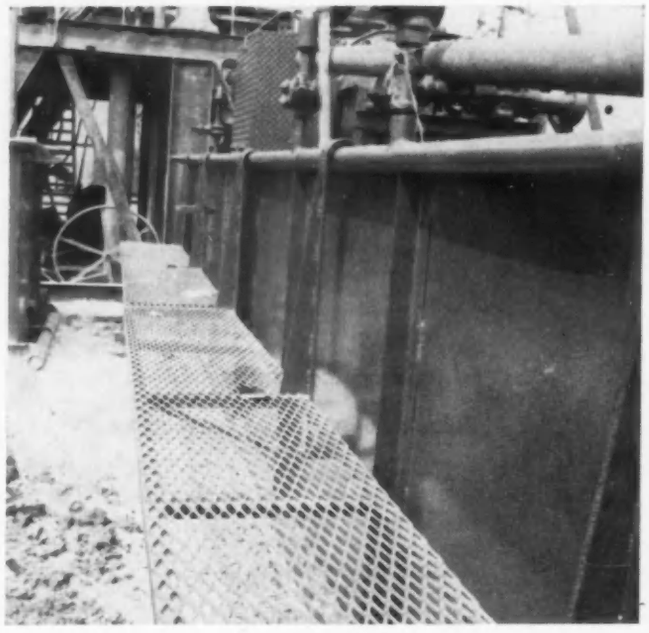
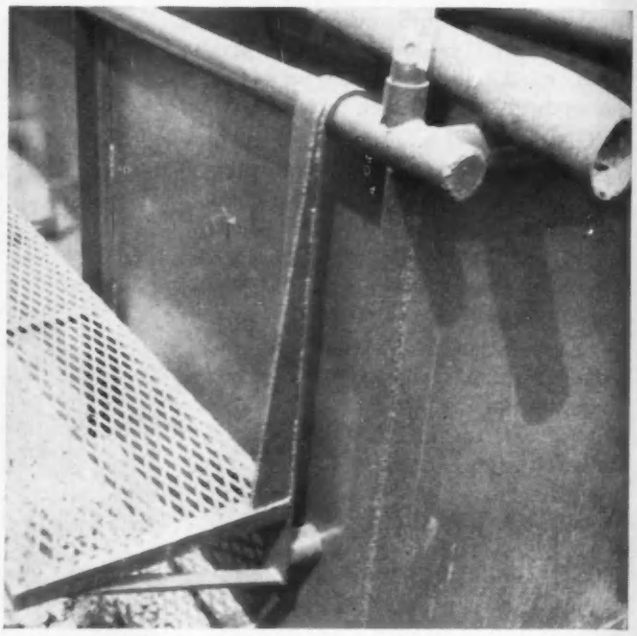
DRILLING HINTS

These **How-To-Do-It** Ideas Can Save You Money

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.





Make Mud Tank Walkway From Angle Iron and Metal

Another method of installing a walkway around a mud tank for operation of the mud guns, checking of the mud, and other mud tank operations, has been devised by a Gulf Coast contractor. Make the walkway, of angle iron and expanded metal into the oblong shapes for the walkway. Bend strap metal about four inches wide into a hook to go over the 3-inch pipe that forms the top frame of the mud tank. Brace this strap metal by a triangular piece that is spot-welded on at 90 degrees and extends down and welds onto the walkway. Another piece of strap metal is used to brace the edge of the walkway.

As noted in the above photo, at right, a short length of 2-inch pipe is welded behind the strap to give the proper spacing and balance to the walkway. When rigging up, lift these walkways and hang over the edge of the tank. When moving, lift them up and lower them into the tank. They can be transported inside the tank.

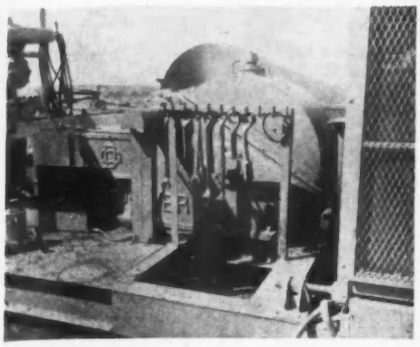
They are hung at a convenient height for the operation of the mud gun, for collecting samples at the shaker or other operations necessary around the mud tank. A good, sturdy, safe footing for these operations is provided.

How-To-Do-It Ideas Earn Money, too!

$10—WORLD OIL editors want how-to-do-it ideas, so your favorite short cut or invention could put money in your pocket! Write down the substance of that latest idea and send it in with a picture or drawing of the installation . . . if accepted, $10 will be yours. Send those money-making ideas today to Hints Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.

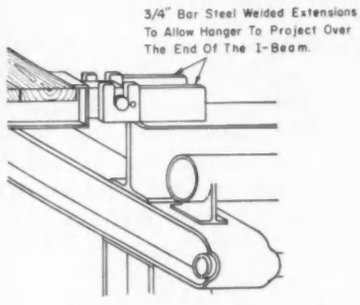
Build Belt Protection And Hand Tool Rack

To protect the pump lubricator drive belt install an easily made, effective guard. Weld two lengths of angle iron side by side to form a deep channel section, and top it with a half-section of pipe which fits over the shaft. The guard affords ample protection to all ordinary hazards present in the area. If necesary, inspect the belt and drive regularly by glancing behind it. Hold the guard in position on the decking by two short pins, welded to the lower



end, which project down through two holes burned through the diamond plate.

Also build an efficient hand tool rack which minimizes the chance of losing or mis-placing end wrenches and box wrenches that are used primarily on the pump. Centrally located, the rack encourages care of the tools; also results in a minimum time being involved when overhaul or liner changes are needed.



Engine Platform Hanger

Install Hinge Type Hangers For Timesaver and Safety

Install engine platform wings on the engine platform. These shop made hinge type hangers permit the wings to swing down to the side of the engine platform by removing the wing braces. Previously, it was necessary to remove the wings from the engine platform in order to move them.

The use of this shopmade device saves rig time during moves since less time is required to handle the engine platform wings. In addition, this new method of handling the engine plat-

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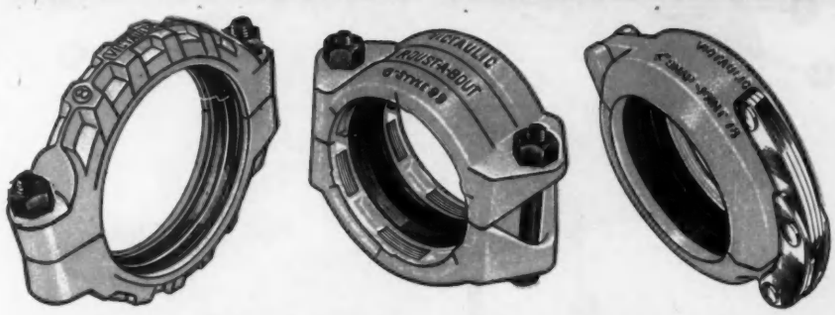

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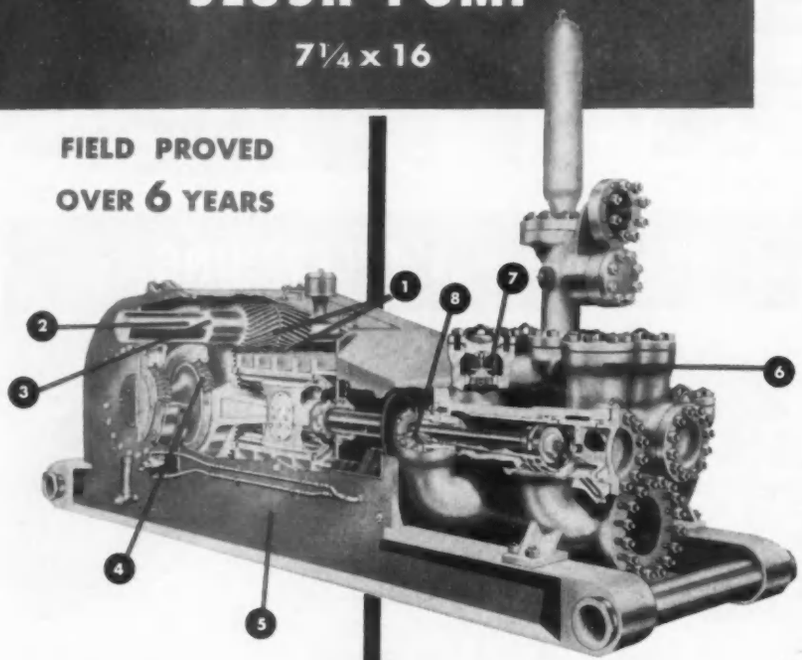
SLUSH PUMP

7¼ x 16

FIELD PROVED
OVER 6 YEARS



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1 Herringbone gears are 16 inches wide for high-strength, long life.
2 Power end has positive *flood* lubrication.
3 Pinion and shaft are integrally forged.
4 Pre-loaded tapered connecting rod bearings with 21-inch O.D.
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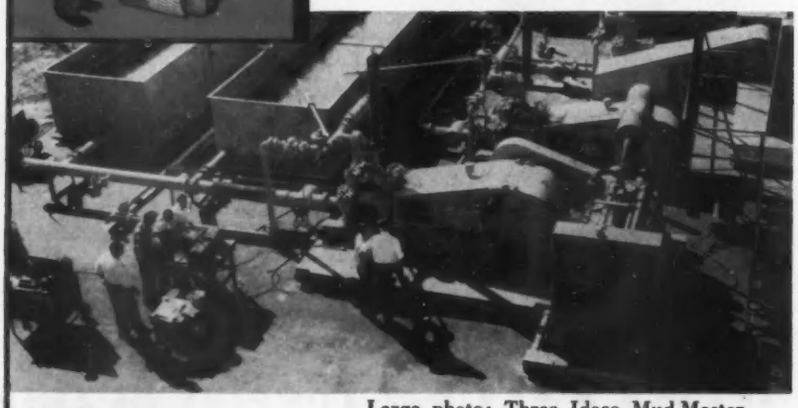
Inset photo shows the large, high-strength 16-inch face herringbone main gear.



Large photo: Three Ideco Mud-Master Duplex Slush Pumps undergoing comprehensive factory tests to record data on capacity and pressure variation with both parallel and series compounding.

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DRILLING HINTS . . .

form wings is safer than the previous methods.

Submitted by an employe of Humble Oil & Refining Company.

Pipe Frame Provides Pump Liner Storage

To provide good storage space for spare liners for mud pumps where they are out of the way and, at the same time, where they can be well kept, build a pipe frame around one inside end of the doghouse the same width as the liner OD. Weld this frame, made of 2-inch pipe, to the doghouse about three inches off the floor. At about 15 inches off the floor, weld semi-circular pieces of 3-inch pipe, approximately four inches long, to the doghouse wall with the open end up. Cut pieces of two-inch line pipe to fit across the end of the doghouse and nest in this cradle, thus forming a bracket that holds the liners in place. The lower brace keeps the liners from skidding along the floor, while the top brace keeps them from tipping over.

Down the side wall, the same arrangement can be made as noted in the above picture. Weld the cradle, made of 3-inch pipe, to the first cross piece member and also to the side of a locker in the doghouse. Place the liners in position and lower the pipe into the cradles, forming an effective guard rail across the top of the liners to keep them from tilting out during moves.

3 ACES IN THE HOLE . . .

to reduce your odds of cleaning out troublesome junk . . .

fish with

K & G Magnetic Fishing Tools

and be sure of maximum recovery . . .

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K & G rental tools available through most fishing tool companies.

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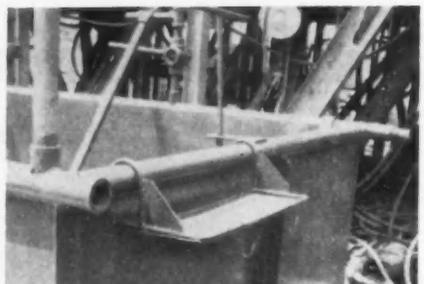
DRILLING HINTS . . .

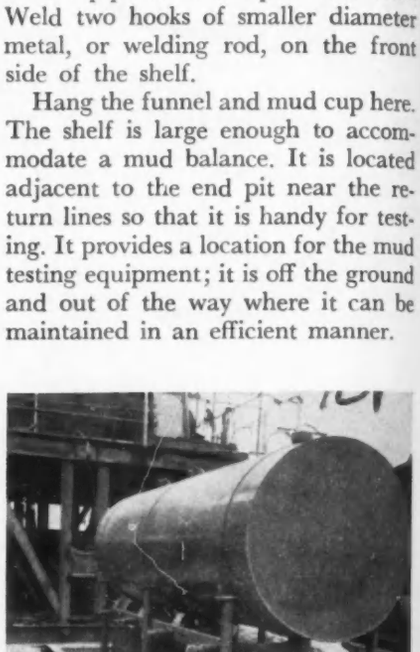
Hang Mud Test Equipment Over Edge of Steel Pits

Hang a simple metal rack for holding mud testing equipment over the edge of the steel mud pits. Make it from scrap metal around the yard. Build a frame of sucker rod pieces with side bracings of scrap metal and a bottom made out of plate metal. Extend the two ends of the shelf beyond the back of the shelf to form additional support against the end of the tank.



Curve the two pieces of sucker rod material that form the upright brace for the shelf to fit snugly over the 3-inch pipe on the top of the tank. Weld two hooks of smaller diameter metal, or welding rod, on the front side of the shelf.

Hang the funnel and mud cup here. The shelf is large enough to accommodate a mud balance. It is located adjacent to the end pit near the return lines so that it is handy for testing. It provides a location for the mud testing equipment; it is off the ground and out of the way where it can be maintained in an efficient manner.



Skid-mount Lubricant Tank For Easier Drum Handling

In order to afford an adequate supply of lubricants around the rig and to dispense with the necessity of handling drums, use larger lubricant supply tanks. Skid-mount and partition these tanks so that they can handle a number of different types of lubricants that are needed around the rig.

Except for the I-beams forming the main parts of the brace, the rest of the material can be made from scraps found in the ordinary contractor's yard. Uprights of three-inch pipe support the tank, as well as the straps and strap-tightening studs. All of these materials can be salvaged from scrap material.

The unit can be spotted in a very convenient location adjacent to the rig, the tank can hold sufficient quantities where frequent refilling is not necessary. Also it is not necessary to handle the drums of lubricants around the location. Moving is easier with this one unit than when six or eight drums must be moved.

"Pit-O-Graf"

RECORDS CONTINUOUS INSPECTION OF MUD PROGRAM

Continuous evaluation of the planned mud program by the driller is made possible by: 1., Instantaneous recording of mud pit level variations (as little as 2 or 3 tenths of one per cent in the entire mud system); and, 2, Pit-O-Graf is placed directly in front of the driller for easy observation.

Pit-O-Graf's continuous record helps prevent unnecessary losses of the drilling fluid. Gas or salt water incursions can be detected as much as an hour and a half to two hours before reaching the surface, giving the crew ample time to close the rams and prevent blowouts. Other information such as jetting mud to and from reserve pit, volume displaced thereby, and whether hole is kept full while coming out of the hole is also recorded by Pit-O-Graf.

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Manufacturers of Mud-O-Graf and Rig Runner.

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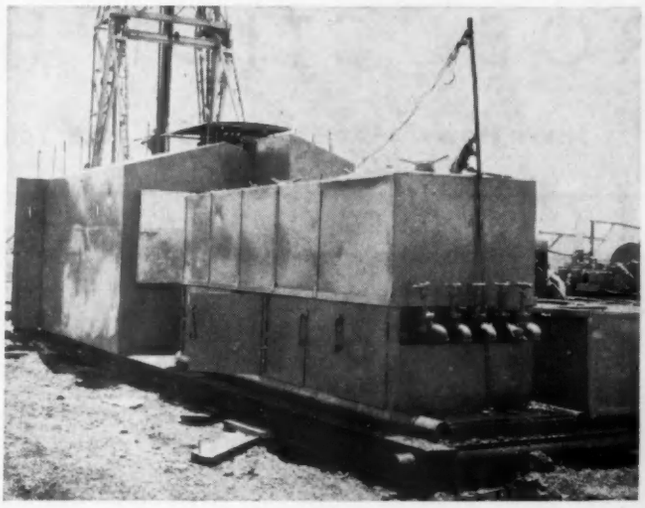
Mount Small Service Parts on One Skid



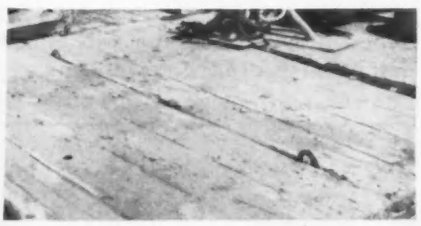
Many contractors have lubricants arranged in racks, or tanks, and skid-mounted; tool boxes are skid-mounted; parts and supply house and doghouse are skid-mounted; and each make up part of a load that must be handled individually. One contractor, however, mounted all of these smaller service functions on one skid as noted in the photograph.

At left is the parts doghouse and change house for the crew. All tools and spare parts are kept in bins, drawers or containers. The tall boxlike structure behind the doghouse is a racking place for extra belts and other long pieces of equipment. Immediately behind that, on the right side of the skid, is a tool and connection box where extra unions, ells, tees, etc., are kept.

In the foreground on the left part of the skid is the lubricant bin divided into five sections with the servicing valves on the far end as noted. Immediately below the lubricant bin is a storage place for greases, pipe dope, paint and other inflammable products.

On moving day, all servicing and utility equipment can be picked up in one load and moved and spotted on the next location with very little trouble. There are not so many small pieces that have to be handled separately.

Equip Wooden Mats With Lifting Eyes

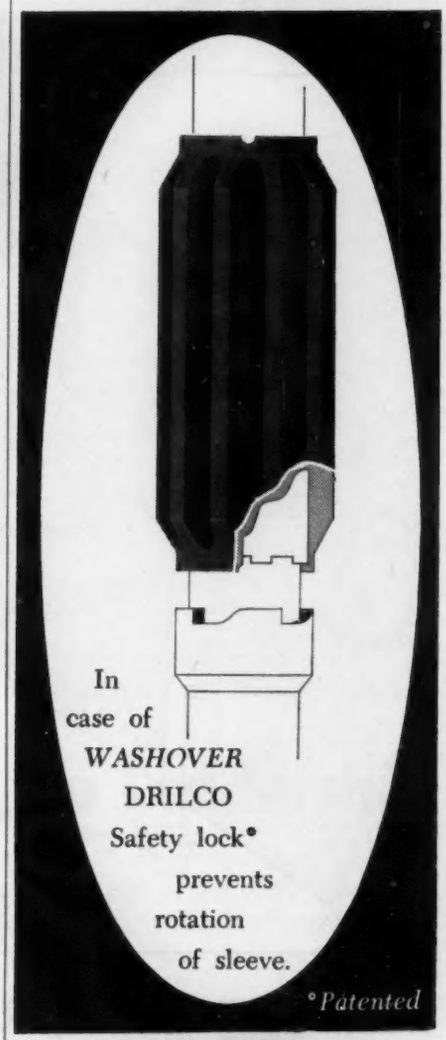


On those rigs which are equipped with wooden mats, make appreciable savings in A-frame and motorized crane time by equipping each mat section with a pair of lifting eyes which can be pulled up from between the planks and are positioned at the approximate center of the mat. Torch-cut the eyes from ½-inch steel plate material and secure them to bars running cross-wise and on the under side of the planks.

When pushed down, the eyes remain flush with the plank surface. When needed, however, all that is necessary to raise them is a nail bar, or similar tool, which is pried upward against a lip-like projection provided on each eye. During rigging-up operations, and in the rush of spotting equipment with the crane, it is the work of but a moment to release the sling hooks, then step on the eyes, clearing the mat so sub-bases and equipment can be moved over the mat immediately afterward.

This system, superior to the method involving wrapping a line completely around the mat, easily can pay for itself in savings in crane and rig time.

run rubber drill collar stabilizers with SAFETY



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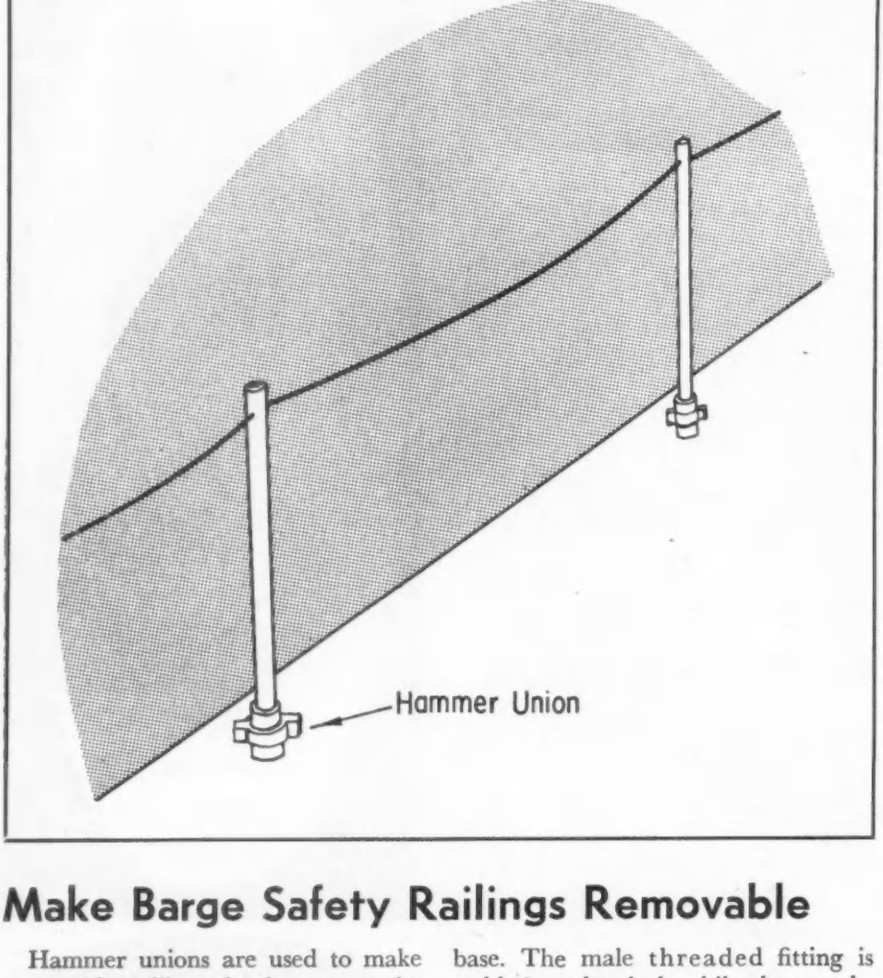
PRODUCTION HINTS

These How-To-Do-It Ideas Can Save You Money

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.



Collect Waste, Scraps In Five-Gallon Can

To collect greasy rags, waste paper and related scrap material, weld a 2-inch fitting to the bottom of an open-top five-gallon can and screw it to a short post of 2-inch pipe, the latter set in concrete beside the tank ladder, entrance gate or other centralized point. There being no need to screw the fitting up tightly, set the container, equipped with a heavy wire bail, on the post, then turn to engage a few threads.

Several advantages accrue from this type of mounting. The 2-inch fitting on the bottom of the can discourages a man from temporarily setting the can on the ground at some other location; instead causes him to bring it back at once to the original position. Mounted on the rigid post, the container cannot be blown over by strong winds, nor molested by marauding dogs or cats if the installation is near a residential area. The single post will prove to be more economical initially and will require less maintenance than commonly used

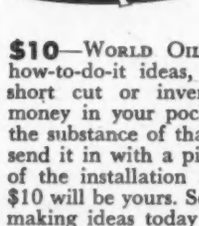
Make Barge Safety Railings Removable

Hammer unions are used to make removable railings for barges on the Gulf Coast.

Most barges need a safety railing of some sort as a precautionary measure for personnel. These guard rails often get in the way when the barge is being loaded and must be removed. In many cases removal is a difficult task which may even require the assistance of a welder.

To provide the security required and still allow quick access to the deck, one foreman installs posts equipped with hammer joints at their base. The male threaded fitting is welded to the deck while the matching half is threaded on a 3-foot piece of pipe. Holes are drilled through the pipe for the cable as shown in the illustration.

When in place the posts provide a rigid support. When necessary, a quick blow with a hammer releases the posts and they can be laid on the deck or taken away. The ease with which the operation is performed more than compensates for the expense involved.



How-To-Do-It Ideas Earn Money, too!

$10—WORLD OIL editors want how-to-do-it ideas, so your favorite short cut or invention could put money in your pocket! Write down the substance of that latest idea and send it in with a picture or drawing of the installation . . . if accepted, $10 will be yours. Send those money-making ideas today to Hints Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.

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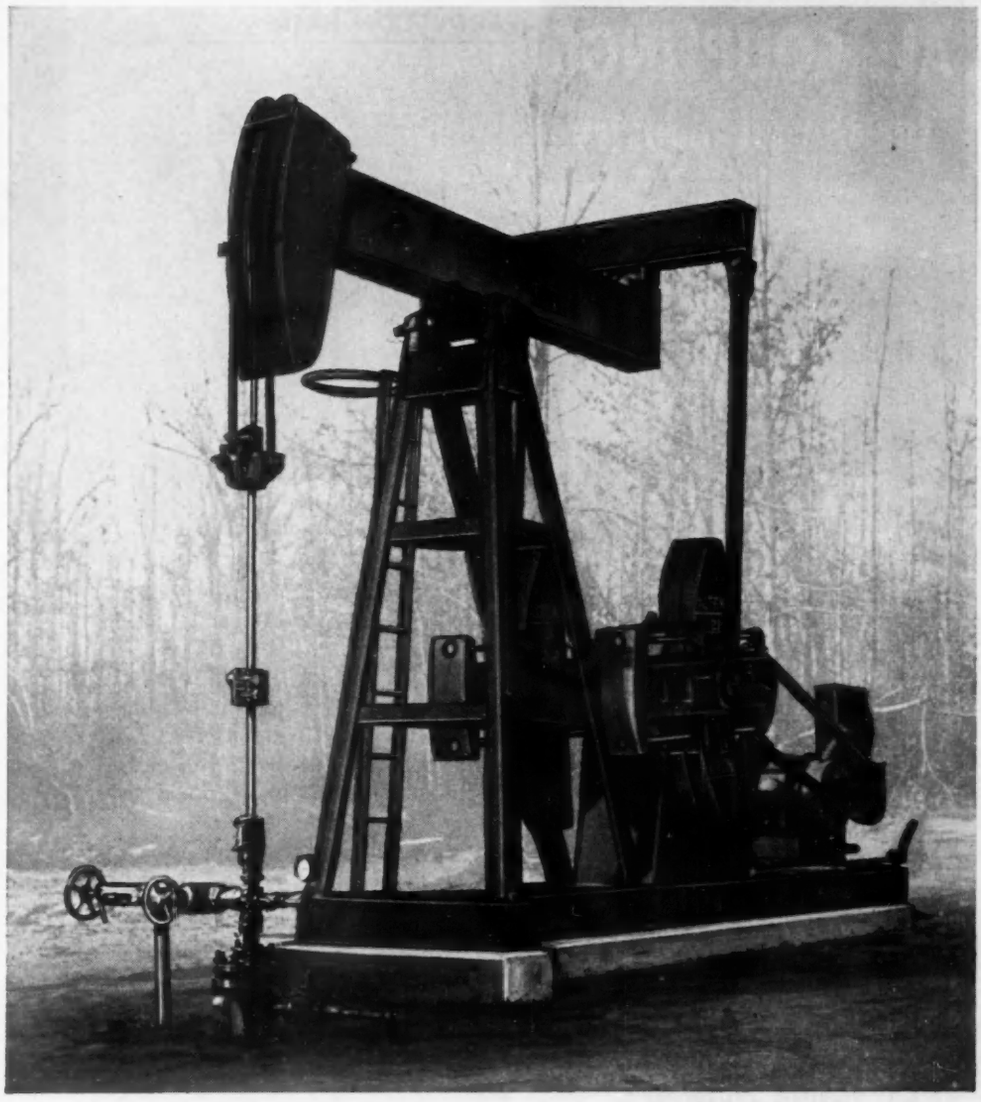

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A full line of 47 models and types including small beam balanced units, beam and crank balanced models, or medium and larger types with the Alten screw-type adjustable counter balance. You can be sure of peak performance with every model in each series.

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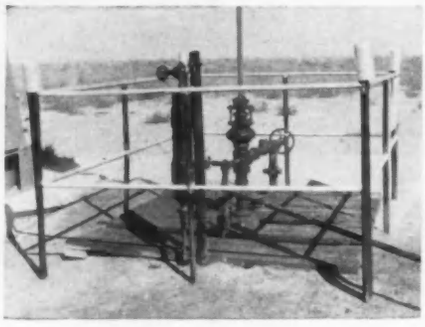
PRODUCTION HINTS . . .

elevated wooden platforms or fabricated steel supports.

Another application of the 2-inch pipe support is seen at the far right, in the accompanying photograph, where it is used to support a fire extinguisher cabinet. Made from a section of large diameter casing, the cabinet, closed off top and bottom and fitted with a threaded connection at the bottom end, is screwed onto a solidly embedded pipe support that assures permanence of that station; a fact that will mean shorter time involved in reaching the extinguisher should need for it ever arise.



Corner Post Bull Plugs Ease Wellhead Work

Hold guard rail panels in position around the wellhead by using four shop-made 3-inch bull plugs to hold corner posts as shown in the photograph. Allow end posts of each of the four panels to extend upward some six inches higher than ordinarily would be required. Bring adjoining sections together at a corner, and drop the bull plugs over the two corner posts.

Duplicated at all four corners, this method of tying sections together, besides saving much welder's time and material, greatly simplifies removal whenever work must be done around the well head. Not only can the entire guard be laid down and removed

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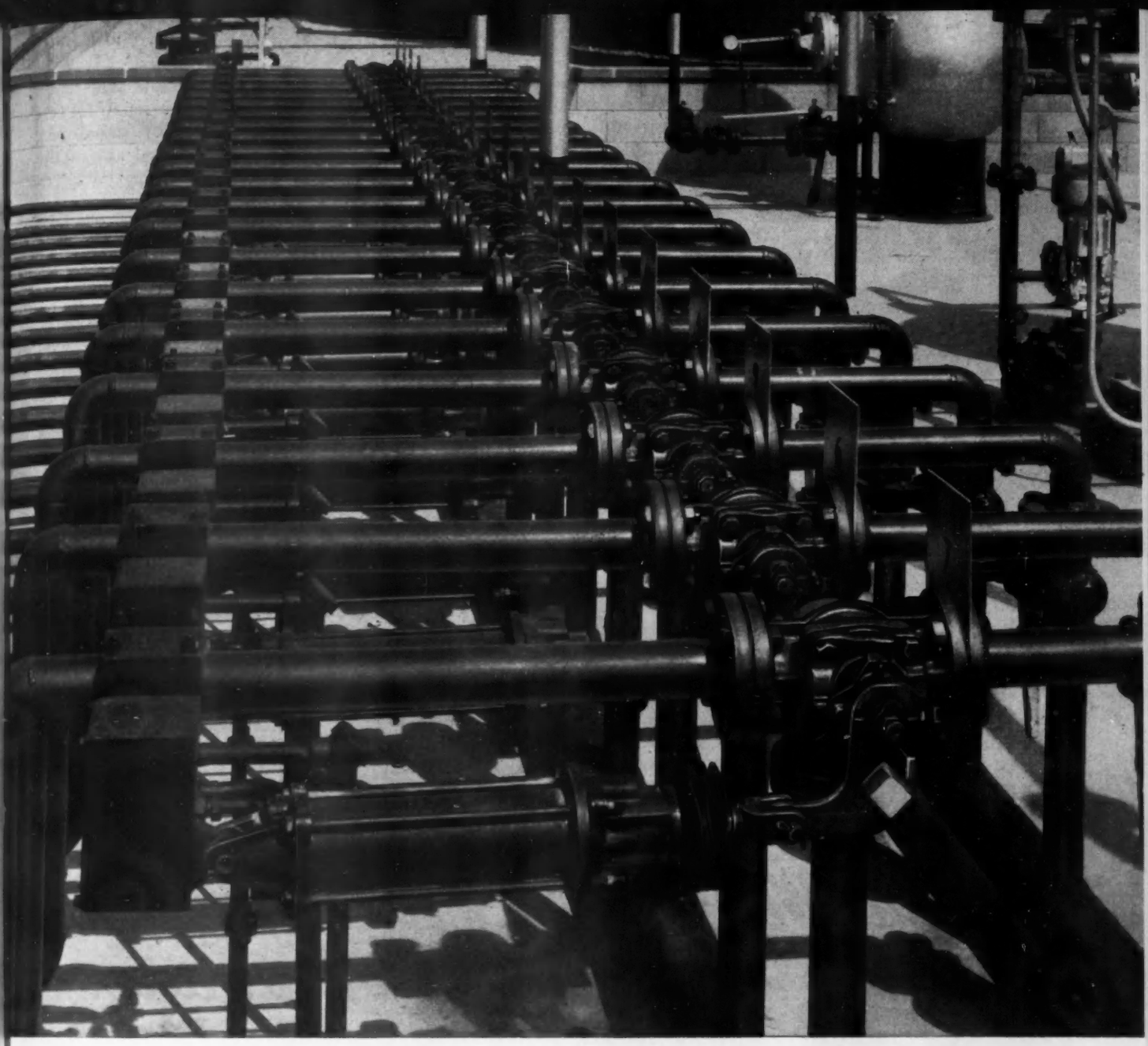

PUSH BUTTON MANIFOLD SAVES TIME, MONEY

Automatic production flow control, like the manifold above, is always fast, foolproof and economical when you use Rockwell-Nordstrom valves.

The positive shut-off, trouble-free dependability and money saving advantages of wrench and gear operated Rockwell-Nordstrom valves have been proven in the production fields for forty years. In automatic operation, you get the same cost-cutting advantages, and more. Because Rockwell-Nordstrom valves close with a lubricant-smooth quarter-turn, you do not need an extra heavy force to wedge-in the seat. This means that actuators can be simpler, less costly.

Insist on rugged, money saving Rockwell-Nordstrom valves for your next installation or valve replacement program. They cost no more to buy—often less—than ordinary valves, and are available in a complete range of sizes with electric, pneumatic and cylinder operators. See your nearest oil field supplier or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee:* Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

Lubricant Sealed For Positive Shut-off

40th YEAR *of lubricated plug valve leadership*

quickly and by only one man, but any individual section alone can be pulled aside, or laid down, to permit access to well head fittings for routine maintenance work.

Pumping Unit Guard Eliminates Accidents

To eliminate a potential hazard when the pumper or mechanic is working in or around the gear box or V-belt sheaves while the pumping unit is operating, equip the rear guard panel with an overhead, sloping panel that effectively prevents a man from raising up and accidentally moving into the arc of travel of the beam counterweights. Such a hazard is particularly acute when the crank pins are out in the last hole, resulting in a maximum-length stroke and causing the beam to come down close to the gear box area.

The guard can be made and installed easily. Determine the arc of travel of the unit and, at the appropriate place, attach the extra panel with the aid of a pair of triangular brackets which can be bolted to the existing rear panel.

The one time that such a guard might prevent a serious injury to a workman will pay out the slight extra cost many times over.

Protect Flow Line Valve From Possible Rupture

Provide protection against the possibility of rupturing of tubing or flow lines, or blowing-out of the polished rod stuffing box should a distant flow line valve be mistakenly closed, or the line become plugged with paraffin, with the relief valve arrangement in the photograph.

Simplify by the use of the offset-type head which enables connecting the relief valve directly into the top of the casing. The installation is

simple and easily can repay its cost many times over should any of the above contingencies occur. Install the relief valve on the sample cock side of the tubing head. A few 1-inch nipples, elbows and a union are all that is needed to connect the relief valve discharge to the casing outlet.

Also shown in the photograph is the method used for preventing oil spills around the casing head directly below the sample cock. There being no pressure on the casing, it is possible to directly connect a shop-fabricated container, made from salvaged casing, to a tee in the casing outlet. When the pumper takes his sample, excess oil returns to the well.

Close Reservoir System To Keep Solvent Clean

To eliminate the possibility of debris, rain or other foreign material entering the reservoir and possibly the injection system when transferring solvent or corrosion inhibitor from

What the WELL-DRESSED, MEDIUM-PRESSURE Wells are wearing

AVAILABLE THROUGH ALL SUPPLY STORES

This well is equipped with the compact "Tee Base Type" HERCULES Duplex Stuffing Box and HERCULES "Type SO" Tubing Head. The Tubing Head is equipped with HERCULES original overhead packing arrangement and self-aligning hinged slips, making this a simple yet complete hook-up, featuring safety with simplicity and minimum of parts.

If you have any problems involving well head equipment, a phone call, telegram or letter will bring you the desired information — quick.

HERCULES TOOL Company

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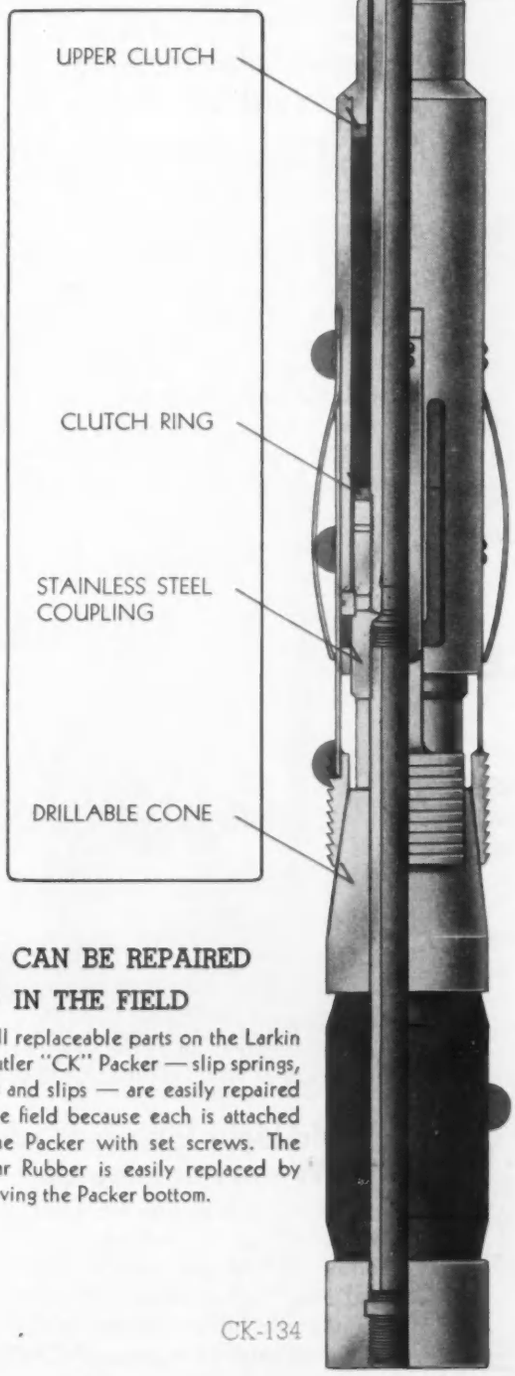
GENERAL OFFICES AND PLANT TULSA, OKLAHOMA

Export Representative: Oil Field Equipment Co., Inc., 30 Church Street, New York 7, N. Y.

NEW Design

greatly reduces the difficulties encountered in retrieving ordinary upside-down type Packers



CK-134

You can retrieve the Larkin of Butler "CK" Pressure Packer so much easier, both under normal and emergency conditions, you'll soon forget the troubles you may have had retrieving ordinary upside-down type Packers.

A flat angle taper on the cone and slips insures smoother, easier movement for setting and removal. The double thick Hycar Rubber also assures more positive removal.

Normally, the "CK" Packer is removed by lowering the tubing several feet and turning one turn to the right. Should this fail, a stainless steel back-off joint allows you to release the upper tubing mandrel. This exposes the circulating area and provides a jar action to dislodge the Packer. If extreme conditions above the Packer prevent removal in this manner — a second back-off is provided. The upper tubing mandrel releases entirely from the clutch ring, freeing the tubing string.

Wire, write or phone any Larkin of Butler office for more specific information.

CAN BE REPAIRED IN THE FIELD

All replaceable parts on the Larkin of Butler "CK" Packer — slip springs, reins and slips — are easily repaired in the field because each is attached to the Packer with set screws. The Hycar Rubber is easily replaced by removing the Packer bottom.

LARKIN of Butler

LARKIN and COMPANY, INC. *Butler, Penna.*

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PRODUCTION HINTS . . .

the large drum to a smaller reservoir, install the illustrated closed system. Install an inlet at the top of the reservoir and run a line from the drum to the reservoir, thereby eliminating the necessity of moving the reservoir lid except for an instant to check fluid level in the reservoir.

To allow a little more flexibility in the positioning of the drum on its stand, place a short length of rubber hose in the line between the drum and the reservoir. This additional flexibility saves time without destroying the effectiveness of the closed system.

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Performance in the field is what counts . . . and that's where JENSEN JACKS prove their stamina, efficiency and economy. More than 36 years of study, extensive research and manufacturing know-how go into the making of every JENSEN JACK.

If lifting the MAXIMUM amount of oil at MINIMUM cost is important to you, get proof of JENSEN's proved performance. Just write us at Coffeyville, or see your nearest dealer.

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JENSEN BROS. MFG. CO., INC.
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Spike Telephone Guy Lines To Ward Off Livestock

To prevent power pole or telephone pole guy lines from becoming loosened by livestock rubbing against the convenient guy lines in open range country, equip all such guys with a length of two by four through which numerous spikes have been driven, at right angles to one another so all sides are equipped with the pointed ends. Hang on the guy with a few wraps of heavy wire.

The result will be a decrease in maintenance and repairing of power and telephone lines.

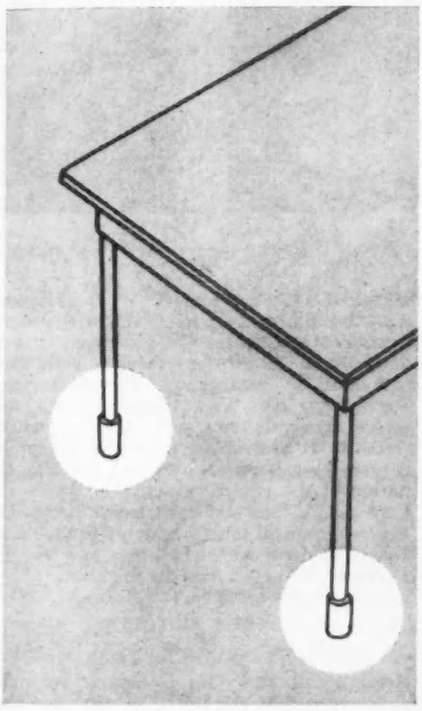
Weld Light Pipe in Stack To Warm Pumping Unit

To increase engine efficiency, especially during colder winter months, equip the pumping unit prime mover with the inexpensive, shop-made air intake pre-heater shown in the accompanying photograph. Slip a

cylinder of light pipe, about two inches larger in diameter than that of the vertical exhaust pipe, over the stack and weld into place.

Air, drawn in through openings left in the top of the chamber, circulates around the hot exhaust pipe and is drawn out through a fitting welded in the bottom of the sleeve. Ordinary stove pipe and elbows, the latter clamped on with straps, convey the heated air to the engine intake manifold.

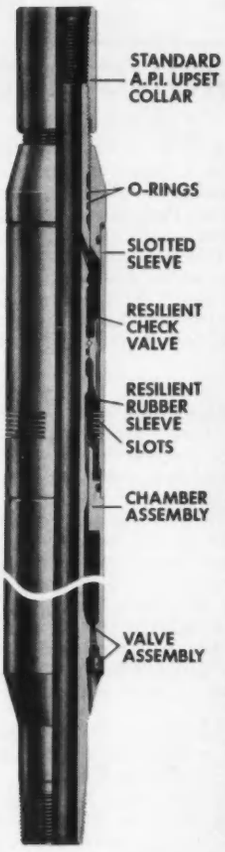
Light in weight, easy to install or remove, this air heater assures constant engine speed and efficiency not only during cold weather periods but during the periods of rapid temperature changes at night and in the early morning.



Adjust Pipe Table Legs With Couplings on Bottom

Considerable difficulty often arises in leveling work benches, drawing tables, etc., on location, in a shop and elsewhere. To eliminate this situation on shop-made equipment, place couplings on the bottom of the pipe legs and make the necessary leveling adjustments easily.

Merely thread the bottom inch or two of each pipe leg and put a coupling on each one. If desirable, insert plugs in the bottom of the couplings to provide a greater bearing surface on the floor.



TYPE C

OTIS GAS LIFT VALVE

Largest flow ports . . . smallest O.D. of any available valve

The operating principle of the Type C Otis Gas Lift Valve is so completely different from conventional gas lift equipment that it makes available certain production practices that heretofore have not been possible for wells on gas lift.

Remarkably simple in design and construction, Type C valves can be used for continuous or intermittent flow, they can be used in dual completions, they are adaptable to permanently-completed wells, they can be adapted for casing flow, and certain sizes can be installed without pulling tubing.

A resilient rubber sleeve is the only moving part, and extremely small opening and closing differentials are possible, even with sand-laden fluids. The valve is built *around* a full-opening mandrel (rather than alongside the tubing) which affords greater strength than the tubing itself. The check seals positively and does not require velocity to close. When used in an intermittent operation, a minimum amount of gas is required to lift the load of fluid, regardless of surface choke settings or long flow lines.

The Type C Otis Gas Lift Valve has so many significant advantages that we believe it has advanced gas lift technology by at least ten years. Ask an Otis man why.

OTIS PRESSURE CONTROL, INC.
Gas Lift Division: 2402 Broad Street, Houston
Branches Throughout the Oil Country

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

What's Happening

AMONG MEN IN THE INDUSTRY

Reese H. Taylor

W. L. Stewart

A. C. Rubel

F. L. Hartley

Reese H. Taylor was elected chairman of the board of **Union Oil Company of California.** He will remain as chief executive officer of the Company. **W. L. Stewart, Jr.,** formerly senior vice president, was elected vice chairman of the board, and **A. C. Rubel,** formerly vice president in charge of exploration and production, was elected president.

Taylor has been president of Union Oil since 1938 as well as a director and member of the executive committee. Both Stewart and Rubel are directors and members of the executive committee.

In addition, **F. L. Hartley,** director of research, was elected a vice president of the company.

•

Norman E. Thompson has been appointed district geologist in charge of a new district office of **Nortex Oil and Gas Corporation** in Corpus Christi. Before joining Nortex, Thompson was district geologist for Lion Oil Company. In this office he will handle all exploration activities of Nortex for the Texas Gulf Coast area. Offices will be located in the Wilson Tower building.

N. E. Thompson

•

E. D. McElvain has been promoted to manager of **Phillips Petroleum Company's** Washington, D. C., office, replacing **R. C. Jopling,** vice president, who is retiring. **C. D. Whitfield,** assistant to Jopling, is replacing McElvain as director of the Natural Gas department's industrial development division in Bartlesville, Okla. McElvain joined Phillips as an attorney in 1930. He was appointed coordinator of the Natural Gas department and later named director of its new Industrial Development division. Whitfield joined the company in 1930 and has been manager of the Haskell, New Jersey, Philgas operations.

•

William W. Richardson and **Warren M. Albert** have been appointed assistant comptrollers of **Socony Mobil Oil Company, Inc.** Richardson, who has been with the company for eight years, has been secretary of the coordination committee. In his new post he will be responsible for producing, accounting and Middle East analysis and statistics. Albert was formerly affiliated with Magnolia Petroleum Company, where he worked for 28 years. His portfolio will be domestic marketing accounting and manufacturing, pipe line, and research laboratories accounting.

•

Richard C. Marmaduke has been appointed chief geologist for **The British-American Oil Producing Company,** it was announced. He will move from Oklahoma City, where he has been division geologist for the company's Central division, to the headquarters office in Dallas. Marmaduke started with British-American in 1952 as a staff geologist. **Harold J. Reedy** will replace him as Central division geologist.

•

U. S. Drilling Company has added a new management team of **Jack Skeehan** and **Jesse Parker.** They were given a percentage of the firm at the time they joined the company's ranks. Each was given 20 percent of the outstanding stock of the company and its subsidiaries. They were appointed vice president and drilling superintendent, respectively. Skeehan has spent the last nine years in the business handling the details of contractual affairs, while Parker has supervised the operations of drilling equipment.

•

L. H. Meltzer, formerly with **Union Producing Company** has opened his office as consulting geologist in The Warwick building in New Orleans. Since 1936 he has been a geological scout with Union Producing Company, geologist in the Gas and Oil Reserve section and head of the Exploration section of the Geological department.

•

J. M. Evans has been appointed assistant vice president of **Standard Oil Company of California** to provide engineering counsel to Standard's operating companies. Evans, previously chief engineer, has been engaged in design and construction activities since joining the company in 1915. Succeeding him as chief engineer and head of the company's Engineering department is **E. S. Warner,** who has been assistant chief engineer since 1947. Warner joined Standard in 1936 as an assistant engineer.

•

Shell Oil Company has announced six personnel changes in its financial department. **B. F. Holt,** treasury manager of the firm's Atlanta marketing division, will retire at the end of the year. **L. L. Duncan,** assistant manager of the head office marketing-accounting department, will replace Holt. **J. T. Kirk,** treasury manager, Minneapolis division, will move to the head office in New York to replace Duncan. **C. S. Sims,** chief accountant, New Orleans division, will replace Kirk as treasury manager in Minneapolis. **S. A. Kolp** will replace Sims. He was formerly chief accountant of the Atlanta division. **R. D. Rodgers,** formerly chief accountant of the Albany division and now on special assignment, will replace Kolp.

•

Harold G. Osborn

A. W. Tarkington

Harold G. Osborn and **A. W. Tarkington** have been promoted to senior vice presidents of **Continental Oil Company** it was announced. Osborn previously was vice president in charge of manufacturing. Tarkington was vice president and regional general manager. Also promoted were **R. L. Bosworth,** formerly treasurer, to vice president in charge of the coordination of the company activities at Ponca City, Okla., and assistant treasurer; **L. C. Peters,** financial vice president, to financial vice president and treasurer; and **G. T. Pearson,** director of organization planning, to regional general manager.

•

Reserve Oil and Gas Company recently announced that the board of directors has promoted **Max C. Eastman** to executive vice president. Eastman has been Reserve's vice president in charge of field operations since 1951, with headquarters in Bakersfield. For the past five years, he has supervised the company's exploration and the development arising from several discoveries. He was elected a director of Reserve in 1955.

•

Sohio Petroleum Company has announced three new promotions. **Joseph B. Cobb,** district engineer in the Lafayette district, moved up to district superintendent, Houston district. In this new capacity he will supervise all Houston district operations and will report to **B. W. Whiteley,** Gulf Coast division superintendent. Cobb joined Sohio in 1947 as a field engineer. **Zack T. Grapes,** field superintendent in the Lafayette district, was promoted to the newly-created position of assistant district superintendent in Lafayette. He will report to Lafayette district superintendent **L. R.**

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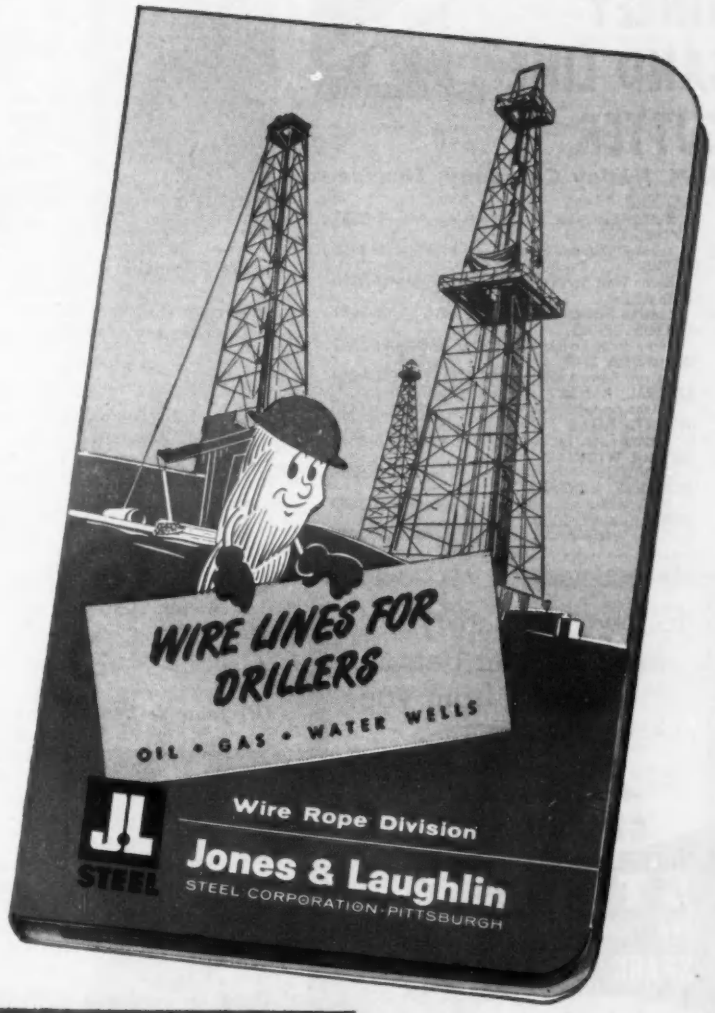

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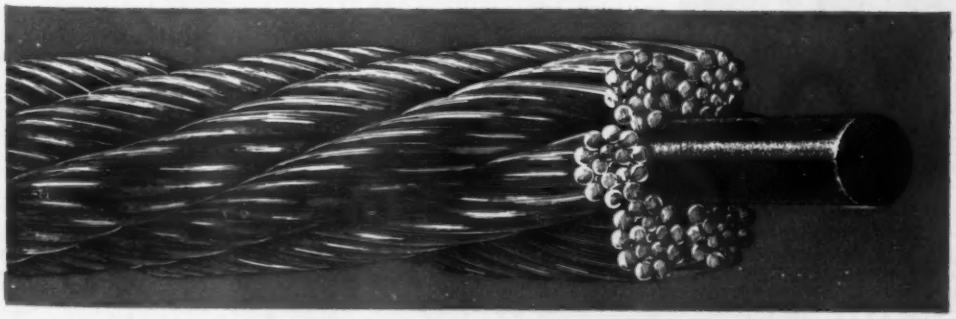

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Records and assist him in the supervision of all district operations. Grapes was employed in 1946 as a toolpusher. **Jerry A. McKnight**, senior engineer in the Houston district, replaced Cobb as district engineer in the Lafayette district. McKnight worked for Sohio as a roustabout during the summer of 1946 through 1949 while going to school. He was regularly employed in 1950.

•

W. F. Walker has been appointed public relations manager for **The Vickers Petroleum Company, Inc.** He has joined Vickers after two years as public relations director for Henry's Inc., a Wichita retail clothing store. His association with the oil industry is through his former position as editor of Merchandising Publications of The Pure Oil Company of Chicago. Before going there Walker had been assistant manager of Sovereign Service, Inc., a Vickers affiliated company, for four years.

W. F. Walker

•

Jennings B. Hamblen, formerly safety director of Pan-Am Southern Corporation, has been named assistant director of safety for the **American Oil Company.** Hamblen joined the research department of Standard Oil Company (Indiana), parent company of American, at the Whiting, Ind., refinery in 1927. In 1947 he was in New Orleans as general manager of manufacturing for Pan-Am Southern, and in 1951, was named safety director for that company.

•

Dr. John V. Pennington's appointment to the advisory board of directors of **Imperial Oil Company of Texas** has been announced. A mechanical engineer and physicist, he has had 24 years experience in drilling, producing and refining. Imperial of Texas was formed for the primary purpose of increasing production from producing oil and gas properties.

John V. Pennington

•

Dolf W. Fieldman has been added to the geological staff of **William J. Carey**, oil producers, at the Carey office in Grand Junction, Colo. Fieldman was most recently manager of the Eagle-Picher Company office in Grand Junction. **Harry E. Haynes** remains as Carey district manager.

•

Camay Drilling Company has announced the appointment of **M. D. (Dale) McBride** as manager of Mesa Drilling Company division of Camay Drilling Company, with headquarters in Denver. McBride joined Camay after 20 years with Arrow Drilling Company of Tulsa, where he was executive vice president.

J. E. Heston was elected president of **Arkansas Fuel Oil Corporation,** succeeding **Robert L. Kidd**. Heston resigned as vice president of Cities Service Oil Company and Kidd resigned as president of Arkansas Fuel Oil Corporation to accept the presidency of Cities Service Oil Company. Heston and Kidd have been associated with the Cities Service system for many years and have had experience in all phases of petroleum operations, particularly in oil and natural gas exploration and production. Heston has been associated with the Cities Service system since 1930, beginning as a geological scout. He has served as assistant director of production in the Petroleum Administration for War, manager of the Oil Production department of Cities Service Petroleum, Inc., and as vice president and director of Cities Service Oil Company. Kidd joined the Cities Service system in 1925 as a geologist and later became vice president of Cities Service Oil Company, in charge of oil and gas production and exploration. He has also been president of Arkansas Fuel Oil Corporation, Arkansas Pipeline Corporation and Orange State Oil Company.

Robert L. Kidd

•

Dr. H. H. Power, professor of petroleum engineering at The University of Texas, and Mrs. Power, have just returned from Holland. Holding a Fulbright grant, Dr. Power lectured at Delft Technical University and addressed several technical groups in Europe, including the Royal Society of Engineers at The Hague.

•

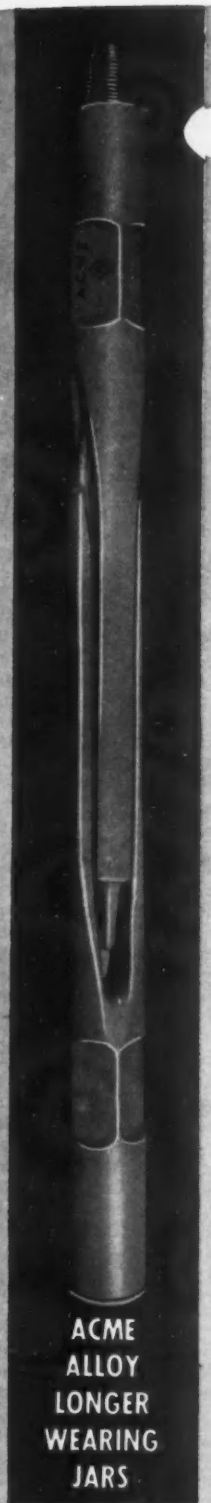
Alex W. McCoy Associates, Inc., geological consultants, have added two geologists to their staff as a part of their current expansion program. **Martin W. Schramm, Jr.**, was placed on temporary duty in Pittsburgh, Penn., and **Thomas Herndon** was added ot the Tulsa staff. In addition, consultants **Orville A. Wise, Jr.** and **Arthur C. Laura** were placed on temporary duty to service clients in the Columbus, Ohio, and Albany, N. Y., areas respectively.

•

J. T. Crooker has been appointed district superintendent of **Standard Oil Company of California's** Red Wash field in Utah. He was formerly assistant chief engineer for producing at the company's San Francisco offices. The new appointment is the first of several steps involving transfer of Red Wash operations from The California Company, a wholly-owned subsidiary of Standard, to the Producing department of Standard's western division. Transfer of staff and equipment is expected to be complete in about a year.

•

Dr. P. P. Reichertz has been appointed supervisor of the Production Research division at the Field Research laboratory of **Magnolia Petroleum Company.** Dr. Reichertz has been associated with production research since joining the Field Research laboratory in 1943.



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5. We use SUPERIOR STEEL in Acme Alloy Jars. It is a triple strength alloy steel, grade AISI 4340 made out of chromium, molybdenum, and nickel. It is a longer wearing alloy steel than the single alloy used in a competing make. Acme Alloy Jars have 1300% more alloy in them than any other make on the market. We use a chrome-moly-nickel steel which is rich in nickel, producing a greater depth of hardness penetration than the single alloy used by a competing make. LONGER WEAR is the bonus you get from the superior alloy steel in Acme Alloy Jars.

6. We use ATOMIC AGE WELDING methods. The welding techniques of today permit use of alloy steels far superior to those used at the time weldless jars were first made. The atomic age has made the weldless method obsolete. We put one electric weld in a set of Acme Alloy Jars. It is stronger than steel. The weld is X-rayed by an electro-magnetic process so that no bad welds can get past inspection. This one weld is in the crotch where the steel is 50% heavier than in the rein section. Both sections of the jars are drop forged. This method of making alloy jars enables Acme to use a superior alloy steel, and you get a superior alloy jar with less breakage and longer wear.

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Howard M. Temple

C. H. Calvert, Jr.

Howard M. Temple was appointed secretary and **C. H. Calvert, Jr.**, was named production manager of **Commonwealth Oil Company** of Houston. Until recently, Temple was legal adviser to the Pan American Production Company's Land department, and was formerly with Hunt Oil Company in Dallas. Calvert will be in charge of Commonwealth's drilling and production activities in the Gulf Coast, South Texas and South Louisiana areas. He was formerly assistant division superintendent in the Houston office of D. D. Feldman Oil and Gas Company. They also will serve in similar capacities in the Marine Gathering Company, a Commonwealth subsidiary, which also is expanding its drilling activities.

•

E. J. Grivetti, Billings, Mont., has been promoted to division geophysicist for **Continental Oil Company's** Billings exploration division. Formerly a geophysical supervisor in Billings, he succeeds **A. W. Black**, who has been transferred to the company's Rocky Mountain region offices at Denver. Grivetti joined Conoco in 1948 and served on company geophysical crews in several states before his promotion to geophysical supervisor at Billings in 1955.

•

Sam N. DeWitt

Sam N. DeWitt of Dallas is the new general manager of **Voss Oil Company** in Newcastle, Wyoming. DeWitt, former vice president and general manager of Seismogram Library Corporation and president of Century Corporation, also has been affiliated in various capacities with Seaboard Oil Company.

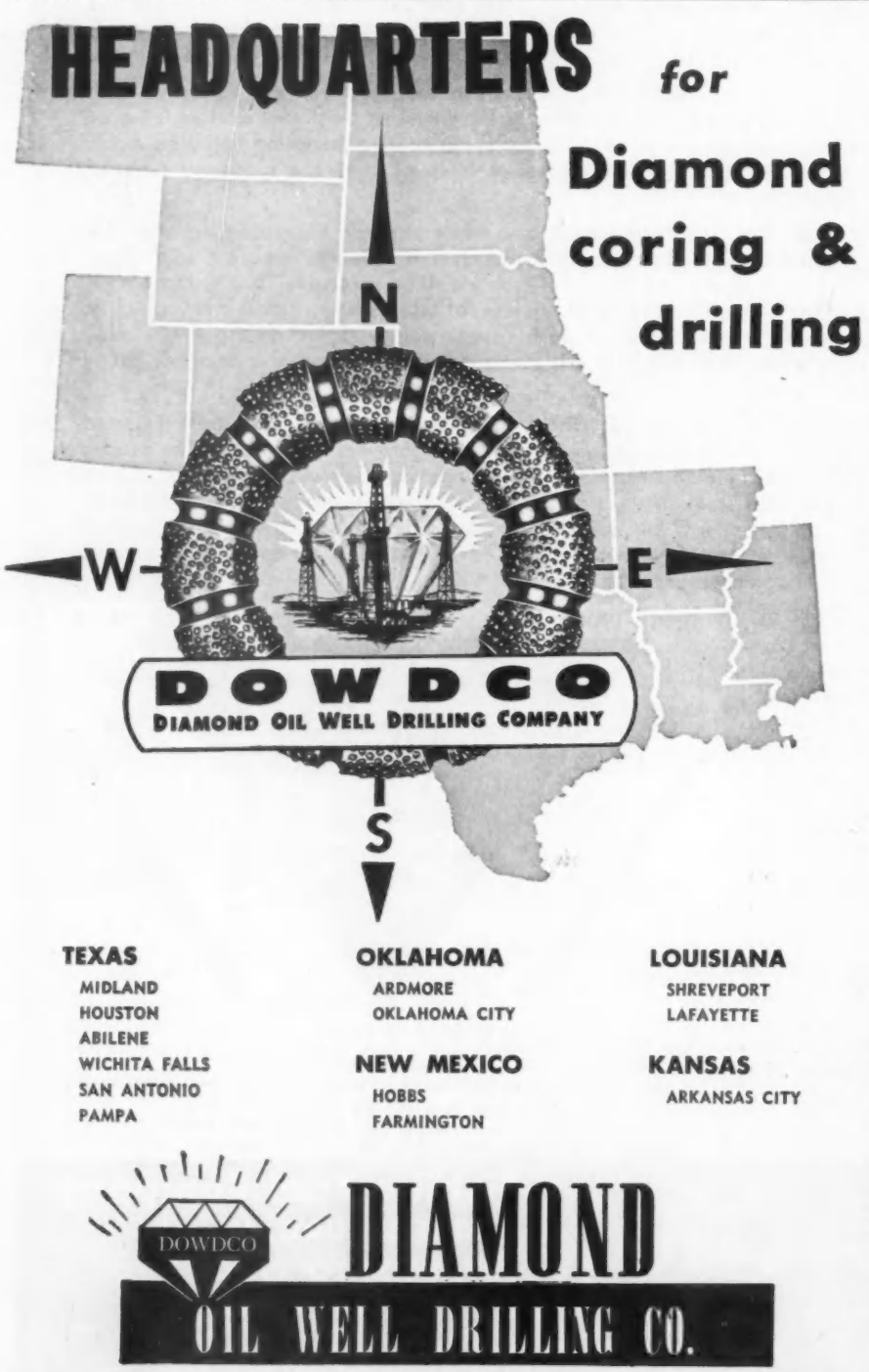
•

New York University's Department of Geology has established a Board of Advisors, composed of 13 executives and scientists from the petroleum industry, to study the problem of a growing manpower shortage in petroleum geology and to plan for the effective preparation of the manpower that is available. **Norval E. Baker**, former chief geologist of Iran Petroleum Company, is chairman of the newly-created group. Other members are **Dr. Frederick A. Bush**, vice president and chief geologist, Sinclair Oil and Gas Company; **Christian F. Dohm**, president, Conorada Petroleum Corporation; **A. J. Freie**, head, Producing department, Creole Petroleum Company; **H. A. Gibbon**, exploration producing coordinator, Standard Vacuum Oil Company; and **Dr. Verner Jones**, exploration manager, Producing department, Socony-Mobil Oil Company, Inc. Also **Richard C. Kerr**, consultant and senior engineer, Arabian American Oil Company; **Roy L. Lay**, assistant to the vice president, The Texas Company; **Walter S. Olson**, supervising geologist, Foreign Producing department, The Texas Company; **Nicholaas van der Sleen**, chief geophysicist, American Overseas Petroleum, Ltd.; **Lewis G. Weeks**, chief geologist, Standard Oil Company (N. J.); **Allan Cree**, chief geologist, Cities Service Company; and **Dr. Hollis D. Hedberg**, coordinator, production coordination staff, Gulf Oil Corporation.

•

Roy E. Campbell has become a partner in the consulting petroleum engineering firm of **Leibrock and Landreth.** The firm will now be known as **Leibrock, Landreth and Campbell.** He recently resigned from Stanolind Oil Company in Midland. Campbell has been associated with Stanolind since 1948. He was engaged in gas pipe line design, gasoline plant construction and operation, reservoir engineering and production development engineering. His latest position with Stanolind was as group leader of the firm's district office Production Engineering section. Much of his Stanolind experience has been in gasoline plant work where he has served as plant engineer for the North Cowden plant in

Roy E. Campbell



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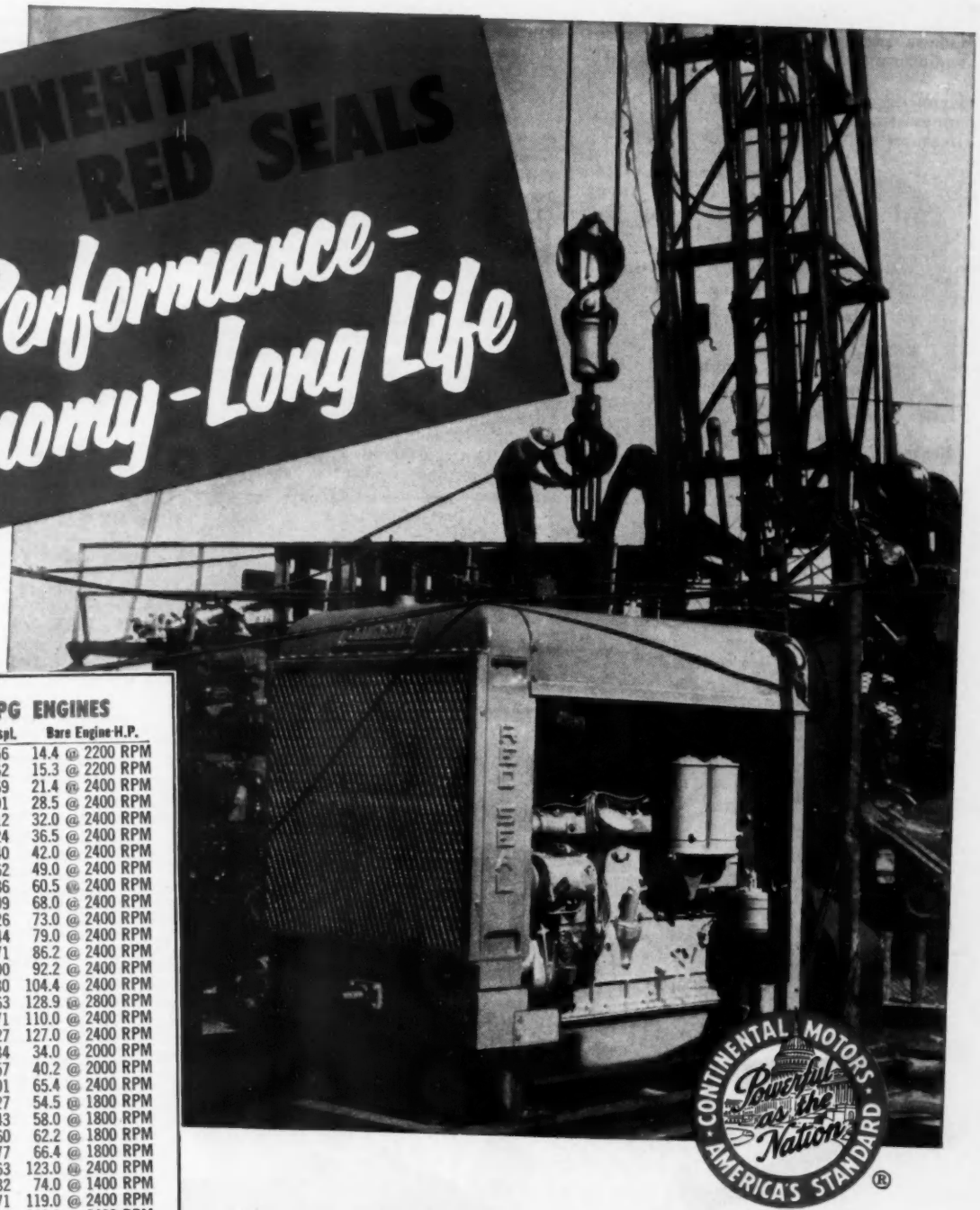

GASOLINE AND LPG ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
N56	4	2¼	3½	56	14.4 @ 2200 RPM
N62	4	2⅜	3½	62	15.3 @ 2200 RPM
Y69	4	2½	3½	69	21.4 @ 2400 RPM
Y91	4	2⅞	3½	91	28.5 @ 2400 RPM
Y112	4	3 3/16	3½	112	32.0 @ 2400 RPM
F124	4	3	4⅛	124	36.5 @ 2400 RPM
F140	4	3 3/16	4⅛	140	42.0 @ 2400 RPM
F162	4	3 7/16	4⅛	162	49.0 @ 2400 RPM
F186	6	3	4⅛	186	60.5 @ 2400 RPM
F209	6	3 3/16	4⅛	209	68.0 @ 2400 RPM
F226	6	3 5/16	4⅛	226	73.0 @ 2400 RPM
F244	6	3 7/16	4⅛	244	79.0 @ 2400 RPM
M271	6	3⅝	4⅛	271	86.2 @ 2400 RPM
M290	6	3¾	4⅛	290	92.2 @ 2400 RPM
M330	6	4	4⅛	330	104.4 @ 2400 RPM
M363	6	4	4 13/16	363	128.9 @ 2800 RPM
B371	6	4½	4⅝	371	110.0 @ 2400 RPM
B427	6	4 5/16	4⅞	427	127.0 @ 2400 RPM
G134	4	3½	4⅜	134	34.0 @ 2000 RPM
G157	4	3⅝	4⅜	157	40.2 @ 2000 RPM
E201	4	3⅝	4⅞	201	65.4 @ 2400 RPM
H227	4	3⅝	5½	227	54.5 @ 1800 RPM
H243	4	3¾	5½	243	58.0 @ 1800 RPM
H260	4	3⅞	5½	260	62.2 @ 1800 RPM
H277	4	4	5½	277	66.4 @ 1800 RPM
K363	6	4	4 13/16	363	123.0 @ 2400 RPM
J382	4	4½	6	382	74.0 @ 1400 RPM
T371	6	4½	4⅝	371	119.0 @ 2400 RPM
T427	6	4 5/16	4⅞	427	140.0 @ 2400 RPM
U501	6	4½	5¼	501	159.0 @ 2400 RPM
R513	6	4½	5⅜	513	164.3 @ 2400 RPM
R572	6	4¾	5⅜	572	182.4 @ 2400 RPM
R602	6	4⅞	5⅜	602	191.7 @ 2400 RPM
V603	8	4¾	4¼	603	220.0 @ 2800 RPM
S749	6	5⅜	5½	749	217.0 @ 2200 RPM
S820	6	5⅝	5½	820	237.0 @ 2200 RPM

CUSHIONED POWER DIESEL ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Bare Engine H.P.
ZD129	4	3¼	3⅞	129	34.0 @ 2000 RPM
GD157	4	3⅜	4⅜	157	39.0 @ 2000 RPM
*ED201	4	3⅝	4⅞	201	45.8 @ 2000 RPM
HD243	4	3¾	5½	243	55.0 @ 2000 RPM
*HD260	4	3⅞	5½	260	59.0 @ 2000 RPM
*HD277	4	4	5½	277	63.0 @ 2000 RPM
*JD382	4	4½	6	382	72.5 @ 1600 RPM
TD427	6	4 5/16	4⅞	427	106.0 @ 2000 RPM
RD572	6	4¾	5⅜	572	154.0 @ 2000 RPM
VD603	8	4¾	4¼	603	175.0 @ 2600 RPM
SD802	6	5 5/16	5½	802	202.0 @ 1800 RPM

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Odessa and later as coordinator of plant engineering for the Midland district office.

•

Kenneth H. Mounger has been named administrative assistant to the secretary-treasurer of **Nortex Oil & Gas Corporation** it was announced. His former position was chief accountant. Prior to joining Nortex in 1955, Mounger was chief accountant of McConnell Drilling Corporation, later becoming vice president and assistant treasurer. When McConnell Drilling merged with Byrd Oil Corporation, Mounger became chief accountant for Byrd Oil. He also took on the job of treasurer of McConnell Drilling and eontinued as vice president and treasurer of this organization as well as serving as chief accountant for Byrd Oil.

Kenneth H. Mounger

•

Malcolm Abel recently resigned as division manager of BBM Drilling Company to become general manager for **W. E. Bakke Oil Company** of Midland and San Antonio. He will have offices in the Union Oil building, Midland. Abel was with Plymouth Oil Company as division engineer before joining BBM as chief engineer.

•

Duvan A. Davidson, Jr., became field superintendent of **Stanolind Oil and Gas Company's** Henderson area recently.

Davidson was moved to Henderson from Houston where he was in the Producing department of Pan American Production Company. He joined Pan American in 1939 as a roustabout. He served in various producing and engineering capacities with Pan Am, being promoted from district superintendent to assistant general superintendent in 1951.

Davidson's transfer is related to the pending consolidation of Pan American Production Company with Stanolind.

As field superintendent, he replaces **W. M. Jones,** who was transferred to Stanolind's Canadian division.

•

K. V. Schroeder

L. M. Moor

Sun Oil Company has named **Kingsley V Schroeder** as director of production in the U. S. and Canada. He succeeded **Robert W. Pack.** Schroeder was assistant division manager and has served also as chief geologist and land manager of the Gulf Coast Production division, Beaumont. He will be succeeded as assistant division manager by **L. Millard Moor.** Schroeder began his Sun career in 1933 as an attendant in a Sunoco Service Station, then rose from roustabout, geologist, to chief geologist to manager of the Land department. Moor, the new assistant division manager, joined the company in 1936. He has been the manager of Crude Oil Purchasing department, Crude Oil Supply and Transportation, and administrative assistant to the division manager.

•

Ben T. Windham has been named sales manager of **Orange State Oil Company,** it was announced. Windham began his career in the oil business working in a service station. He has steadily advanced through various positions in the marketing department of the company, and until recently was in charge of the distribution activities of the company in the Shreveport area. This year he was transferred to the home office to assist in the expanded marketing program.

•

William H. Flood, Jr., has been appointed to the newly-created position of production manager for **Northern Natural Gas Producing Company.** He will be in charge of all drilling and production. A 20-year veteran in the petroleum industry, Flood previously spent 12 years with Republic Natural Gas Company. He has also worked as production manager of the East Alice Operating Company of Alice, Texas, and as petroleum engineer for the Oil and Gas division of the Railroad Commission of Texas.

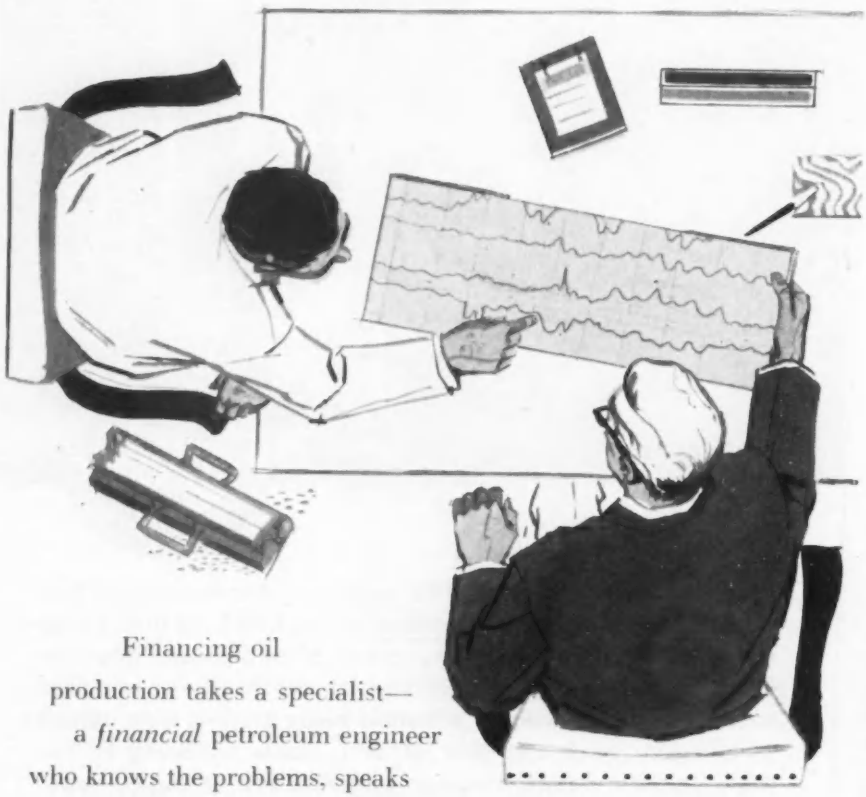
William H. Flood, Jr.

•

John W. Bell, Jr., has joined **Texas Pacific Coal and Oil Company** as district geophysicist for southern Louisiana. Bell

Let's talk over your

PRODUCTION FINANCING



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TEXAS National BANK OF HOUSTON

is a former district geophysicist for Pan American Production Company, with 11 years experience in Louisiana and Texas oil fields. He will headquarter in TP's district office in Lafayette, La.

•

Charles E. Curry was appointed Cleveland purchasing agent of **The Standard Oil Company** (Ohio), it was announced. The position entails responsibility for all purchasing activities in Ohio. Curry joined the Sohio Pipe Line Company as an engineer in 1944. Before that he was with the Kentucky Natural Gas Corporation. He has held the positions of Southwestern division superintendent, Grayville division superintendent, senior division superintendent of the Tri-State division, acting general superintendent of all transportation operations, and chief engineer. He is also vice president and director of Sohio Pipe Line Company and Sohio Southern Pipelines, Inc.

Charles E. Curry

•

Phillips Petroleum Company has announced a number of personnel appointments in its Land and Geological department. **G. E. Benskin**, formerly northwest regional landman in Bartlesville, Okla., has been appointed assistant division manager and division landman at Billings, Mont., and **R. A. Brown** has been transferred from Ardmore, Okla., where he was district landman, to the Bartlesville office to replace Benskin. **E. M. Gorence** has been named regional landman for the northeast region at Bartlesville, replacing **H. M. Young** who has transferred to Billings. **R. P. Clark** and **C. E. Hallock**, formerly geophysical supervisors at Bartlesville, have been appointed to the newly created positions of division geophysical supervisor at Houston and Calgary, Alberta, Canada, respectively. **V. W. Krutsinger**, who was assistant director of the geological engineering analysis section at Bartlesville, has gone to Calgary in the newly created position of division development geologist.

•

William R. Remalia has been appointed manager of product supply in the Supply and Transportation department of **American Oil Company** in New York.

Remalia joined Standard Oil Company (Indiana), parent company of American, in 1938 as a chemical engineer at its Whiting, Ind., research laboratory. He was transferred to Standard Oil's home office in Chicago in 1945 and in the next five years held positions of analyst, senior coordinating analyst and assistant to the head of the coordinating division in the Distribution and Economics department. Later he was transferred to Pan-Am Southern Corporation in New Orleans, an affiliated company, as manager of economics. His latest position was manager of supply for Pan-Am Southern.

•

Gulf Oil Corporation announced the resignation of **Donaldson Brown** as a director and as a member of Gulf's Executive and other committees. Brown, who has been a director of Gulf since 1946, desired to devote more time to his private interests.

Lone Star Steel was built to make API pipe for the oil and gas industries . . . and is now building another open hearth furnace and even greater pipe mill facilities in line with demand.

Our long-time friend, Joe Roughneck . . . heart of the industry . . . needs more and more pipe. Lone Star is preparing to deliver more API casing, tubing and line pipe now . . . and in the years to come.

Neighbor, wherever you are, specify Lone Star and we both get a good deal!

Lone Star STEEL COMPANY

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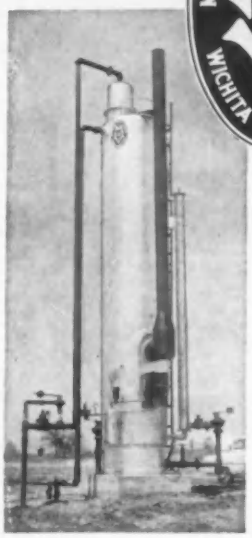
Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

Be **SURE**

of Trouble-Free Performance

Specify . .



TYPE P-V

PRESSURE TREATERS

M & V Pressure Treaters have an unbeatable record of trouble-free performance. They are designed to operate automatically with a very minimum of supervision . . . built to the most exacting standards . . . and offer you the finest possible assurance of full recovery at lowest cost.

MFD BY M&V TANK COMPANY WICHITA FALLS, TEXAS

Steel Fabrication for the Oil Industry

DEATHS

James Anderson, 79, a pioneer in the oil pipe line field and a retired vice president and treasurer of the Humble Oil & Refining Company, died July 29 in a Houston hospital. In 1920 he became president of the Humble Pipe Line Company and the next year was elected a director and vice president of Humble. He was made treasurer of the company in 1941 and held that position until his retirement in 1942. He was a director of Gulf Publishing Company, Reed Roller Bit Co., The Texas National Bank, the Hermann Hospital Estate, and the Houston Lighting and Power Company.

Watson B. Joyes, 65, retired independent oil producer, died at his home in Tulsa July 28.

Philip Arnold, 73, retired vice president of The Garlock Packing Company, died July 3, in Carmel, Calif. Arnold served Garlock in a succession of sales capacities for 48 years attaining in 1929 the position of vice president in charge of sales. Early in 1950 he relinquished active direction of the company's sales activities, although remaining as a vice president in a partially active capacity.

Harold R. Buchholz, 53, division warehouse supervisor for Sinclair Oil and Gas Company, died July 3 in an Oklahoma City hospital where he had been a patient two weeks. Buchholz was employed by Sinclair in 1933.

Donn W. Turner, 35, chemist with Lane-Wells Company eight years, died July 3 at his home.

Dennard Marshall Riggin, Jr., 36, died July 6 in Tulsa. He was with Dowell Incorporated, chemical research laboratory.

Charles A. Parkin, 69, pioneer Tulsa oil operator, died July 7 in a hospital after a lengthy illness. He was general manager for a small independent oil company with operations in Oklahoma and Texas. He retired about 20 years ago.

Chester B. (Jack) Bunte, well-known oilman, died at his ranch near Grand Lake, Grand County, Colo., July 13. He entered the oil business in Okmulgee, Okla., in 1919 and was engaged in exploration in the Okmulgee and Seminole areas. Bunte extended the East Texas oil field into Smith County in 1931 and discovered the Keeran field in Victoria County, Texas, in 1931. He also discovered the Eureka Heights field in Harris County, Texas, and was instrumental in discovery and extension of several other oil pools on the Texas Gulf Coast.

Marshall L. Noel, 50, associated with the construction machinery field since 1928, died in the Venezuelan Super-constellation airliner that crashed into the ocean off the New Jersey coast June 20, killing all aboard. Noel entered the construction equipment field in 1928 when he joined the Allis-Chalmers Manufacturing Company's Tractor division and served as manager of industrial sales. He was made general sales manager of the Tractor division and later was elected vice president and general sales manager. He has also been vice president and treasurer of Tractomotive Corp., Deerfield, Ill., and president of the Frantz Tractor Co., Inc., New York City.

Ray S. Kail, formerly sales manager for Rolo Manufacturing Company, Houston, and for the past year Rolo representative for the north Texas area, died recently at his home in Stamford, Texas. Kail was a veteran of many years experience in oil industry field engineering and sales. He served 15 years as division petroleum engineer with Baker Oil Tool Company in the West Coast and Mid-Continent areas. Before joining Rolo, Kail spent five years with Petroleos Mexicanos in the Republic of Mexico as a special petroleum engineer and assistant to the production manager.

A. W. Walker, professor of petroleum engineering at the University of Tulsa and former head of the school's Department of Production Engineering, died July 19 in a Philadelphia, Penn., hospital. He had been active in the oil industry for more than 20 years before joining the Tulsa faculty.

E. J. Kirberg, coordinator, Manufacturing department, Gulf Oil Corporation, died July 19, in Washington, D. C. He first joined Gulf at its Port Arthur, Texas, refinery in 1922 and served in the Engineering and Construction department and the Refinery Operations department. He was assistant manager of the Refining division of the General Office Engineering and Construction department and then head of the Process division. In October of last year, he was promoted to coordinator, responsible for coordinating the operations of the Manufacturing department with that of the other departments in the company.

Sidney Norman, 85, mining editor of the Los Angeles Times from 1907 to 1909, died recently in Santa Rosa, Calif. For more than 60 years Norman had been a writer and publisher of mining and oil news. Until the age of 80, he had been active as the editor of an oil bulletin in Calgary, Canada.

William H. (Henry) Farr, 57, retired independent oilman, died July 26 in a Tulsa, Okla., hospital.

Albert L. Tietze, retired official of Standard Oil Company, died recently. Tietze started with Standard Oil at Newhall, Calif., in 1911 and was superintendent for the San Joaquin Valley when he retired in 1948.

J. Sutcliffe Warren, 80, former president and chairman of the board of the Maloney Tank Co., died June 18, in Tulsa, Okla., after a lengthy illness.

Dr. John L. Rich, 72, retired chairman of the Department of Geology of the University of Cincinnati, previously head of the Department of Geology of Ottawa University, and for nearly 40 years a member of the American Association of Petroleum Geologists, died in June. One of his studies is the Shoe-String pool of eastern Kansas.

What's Happening

AMONG INDUSTRY ASSOCIATIONS

E. Dale Mount

E. O. Thompson

A. W. Thompson

Robert L. Wood

J. L. Lummus

John H. Thacher, Jr.

Drilling Contractors to Meet in Fort Worth

Six oil industry spokesmen will address members of the American Association of Oilwell Drilling Contractors at their 16th Annual Meeting in Fort Worth, Texas, October 7-9. Advance registration indicates that about 1200 oil men will attend the three-day convention.

C. J. Davidson

The speakers, representing major and independent producing companies, contractors, research organizations and government, will discuss subjects ranging from technical studies to international oil economics. The opening address at the first general session, will be delivered by E. Dale Mount, who has served as president of AAODC for the 1955-56 term.

"World Oil, The Domestic Oil Producer's Position" is the subject chosen by Lt. Gen. E. O. Thompson, Texas railroad commissioner, who will also speak Monday. Oil industry cooperation is the theme of A. W. Thompson's talk Tuesday on "API-AAODC Teamwork—Key to Greater Progress." Thompson, a past president of AAODC, is vice president for production of the American Petroleum Institute. Speaking for independent producers, Robert L. Wood, president of the Independent Petroleum Association of America, will speak on "In Good Times and Bad—Down We Go Together." Two technical papers on drilling engineering developments will be read at the Tuesday general sessions.

J. L. Lummus, Stanolind Oil and Gas Company, Tulsa, will discuss "Development and Application of a New Oil-Base Drilling Fluid."

"Turbo-Drills—Past and Present" will be reviewed by J. H. Thacher, Jr., vice president of California Research Corporation, San Francisco. Co-author of the paper is W. R. Postlewaite, mechanical engineer, Standard Oil Company of California.

All general sessions of the AAODC annual meeting will be held at the Texas Hotel. Convention chairman C. J. Davidson, who is president of Davidson Drilling Company, Fort Worth, will preside Tuesday evening at the banquet which will climax the contractors' meeting.

In addition to the general session, business activities at the convention include meetings of the 12 AAODC standing committees Monday morning. The 1955-56 board of directors will convene Sunday afternoon, with the incoming directors holding the first meeting of their new term on Monday.

Los Angeles D&B Elects Ann Byerley President

Ann Byerley, General Petroleum Corporation, recently was installed as president of the Los Angeles Desk and Derrick Club. Odett L. Coppock, Signal Oil and Gas Company, took office as first vice president; and Margaret M. Martin, Baker Oil Tool Company, as second vice president.

Other new officers include Harriette A. Olson, C. P. Watson Company, recording secretary; Christene McCown, Fluor Corporation, corresponding secretary; and Gladys Hart, Richfield Oil Corporation, treasurer.

Mabel C. Baldwin, C. F. Braun Corporation, and Betty Krarup, V. P. Baker Company, have been elected directors.

Patricia Farrell to Head OIIC Women's Activities

Patricia Farrell, formerly assistant editor of National Petroleum News, has joined the staff of the American Petroleum Institute in New York as supervisor of women's activities for the Oil Industry Information Committee. She will be in charge of women's activities and program materials, including such items as the Magic Suitcase.

She joined NPN in 1948 as a secretary, then became editorial assistant and subsequently assistant editor. In her new position she succeeds Bunnye Lerner who recently resigned.

McNay Is Named Chairman Of OIIC Advisory Council

A. J. McNay, supervisor of the education and motion picture section of the Public Relations department for Standard Oil Company of California, will head the newly-created Educational Advisory Council of the Oil Industry Information Committee. He was chosen chairman at the council's recent organization meeting in New York.

Objective of the council, which is composed of educational specialists on the staffs of oil companies, is to advise the OIIC and the American Petroleum Institute on its educational program.

Chipman Reelected Head Of Crude Oil Association

Charles A. Chipman of Bolivar, N. Y., recently was reelected to his fourth one-year term as president of the Pennsylvania Grade Crude Oil Association.

Other officers reelected at the annual meeting of the board of directors of the association include George J. Hanks, president of South Penn Oil Company, first vice president; A. C. Simmons, Simmons Oil Company, second vice president; and Fayette B. Dow, vice president and general counsel.

Samuel Messer, Quaker State Oil Refining Corporation, was elected treasurer; F. W. Alcorn, Pennzoil Division, South Penn Oil Company, C. L. Suhr, South Penn Oil Company, and C. G. Johnson of Quaker State Oil Refining Corporation, assistant treasurers; and W. C. Wenzel, executive manager.

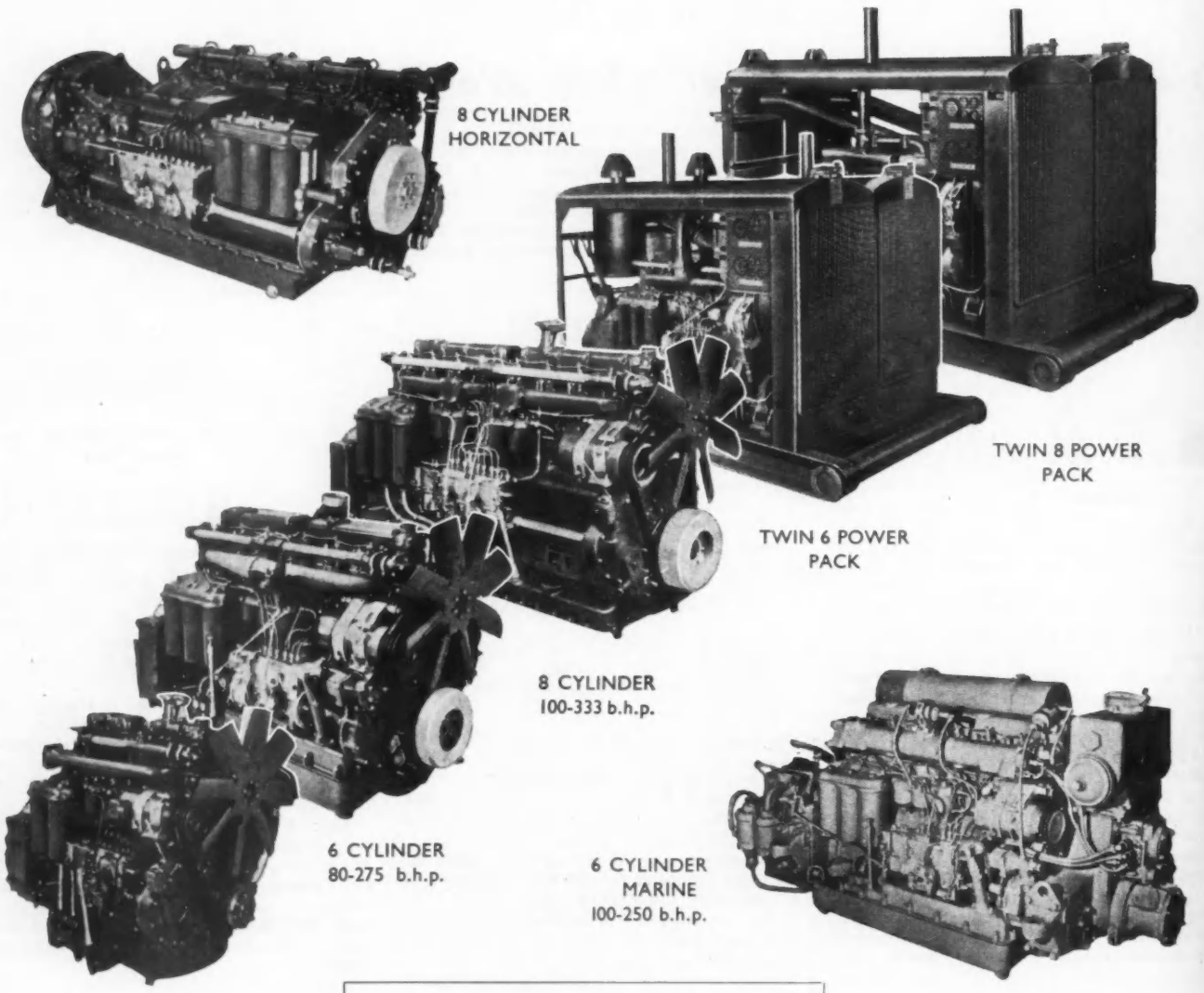
Eastern Section of AAPG Names Ellis President

Dr. Brooks F. Ellis, chairman and curator of micropaleontology, American Museum of Natural History, New York City, will head the Eastern section of the American Association of Petroleum Geologists for the 1956-57 term.

Newly-elected vice president is C. W. Flagler, Gulf Oil Corporation; secretary is Allan Cree, Cities Service Petroleum Ind.; and treasurer, Harrison T. Brundage, Eastern Editor, World Oil.

ROLLS-ROYCE

OIL ENGINES



8 CYLINDER HORIZONTAL

TWIN 8 POWER PACK

TWIN 6 POWER PACK

8 CYLINDER 100-333 b.h.p.

6 CYLINDER 80-275 b.h.p.

6 CYLINDER MARINE 100-250 b.h.p.

4 CYLINDER 60-167 b.h.p.

- Common bore and stroke for entire range of four, six and eight cylinder engines.
- Spare parts common to all engines.
- Right or left hand build, horizontal or vertical.

A range of engines unsupercharged and supercharged 60 - 600 b.h.p.

A SOUND INVESTMENT
in low cost horsepower hours

Complete rationalisation of design and manufacture has enabled high quality to be achieved at competitive prices.

Reliability Orthodox design Rugged construction	PAY DIVIDENDS IN	**Reduced maintenance costs**
Low fuel consumption with sustained high performance	PAYS DIVIDENDS IN	**Reduced operating costs**
Interchangeable parts on all engines	PAY DIVIDENDS IN	**Reduced spares stocks and overhaul costs**
Versatility in a wide range of applications	PAYS DIVIDENDS IN	**Reduction of engine types required**

Rolls-Royce Oil Engines, based on 50 years' experience of high output piston engines, are working in more than 50 countries throughout the world

ROLLS-ROYCE LIMITED, OIL ENGINE DIVISION, DERBY, ENGLAND.

B and W SCRATCHERS AND CENTRALIZERS

B and W Multi-Flex Scratcher

B and W Hinged Nu-Coil Scratcher

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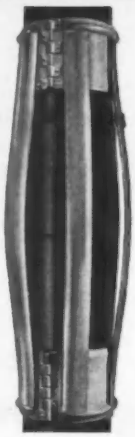
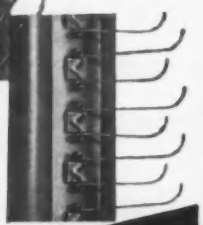

B and W Latch-on Centralizer with Kon-Kave Bow

Multi-Flex Type


B and W Rotating Scratchers

Nu-Coil Type

For a Good Cement Job

Positive Mud Removal and Complete Cement Fill

B and W Inc.

Well Completion Specialists

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Houston 12, Texas
Phone WA-3-6603

WEST COAST
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Los Angeles 54, Calif.
Phone DA-4-1106

3404

Roy F. Bennett

John C. Hollister

Exploration Geophysicists Pick Bennett President

Results of the mail ballot election of 1956-1957 officers were announced by the Society of Exploration Geophysicists. Roy F. Bennett, chief geophysicist of Sohio Petroleum Company, was elected president. Dr. J. P. Woods, director of the geophysical research laboratory for The Atlantic Refining Company, will be vice president. Prof. John C. Hollister of Colorado School of Mines, is the new secretary-treasurer. Terms of office will begin October 29, during the society's 26th annual meeting in New Orleans.

Dr. J. P. Woods

Dr. Norman Ricker, The Carter Oil Company, continues in the 2-year term as editor, with R. C. Dunlap, Geophysical Services Inc., serving as past president to complete the 1956-1957 executive committee.

Graduates Honored

L. T. White of the Cities Service Oil Company, chairman of the Petroleum Education Foundation, presents to Nicholas D. Torchio (center) and Arthur Blaker (right) two of the four checks for $100 for outstanding graduates of the Petroleum Distribution section of the Industrial Distribution department at the New York City Community College of Applied Arts and Sciences. Checks were donated by the Petroleum Education Foundation. New York City Community College is a two-year technical college that offers the Associate in Applied Science degree in 13 areas.

GREATEST ADVANCEMENT IN SWAB HISTORY!

The Oil States Swab is the most advanced swab on the market having been developed and perfected after years of research, painstaking work and engineering skill. It's acceptance has been overwhelming.

HERE ARE THE FEATURES YOU WANTED

- ★ Fewer cups to handle ANY job
- ★ NO Servicing
- ★ Responds to lightest loads
- ★ Swab can be EASILY UNLOADED at any time
- ★ Valve action from base of cup
- ★ Perfect for swabbing following frac jobs
- ★ Only 6 parts Required to Assemble a 2-Cup Swab

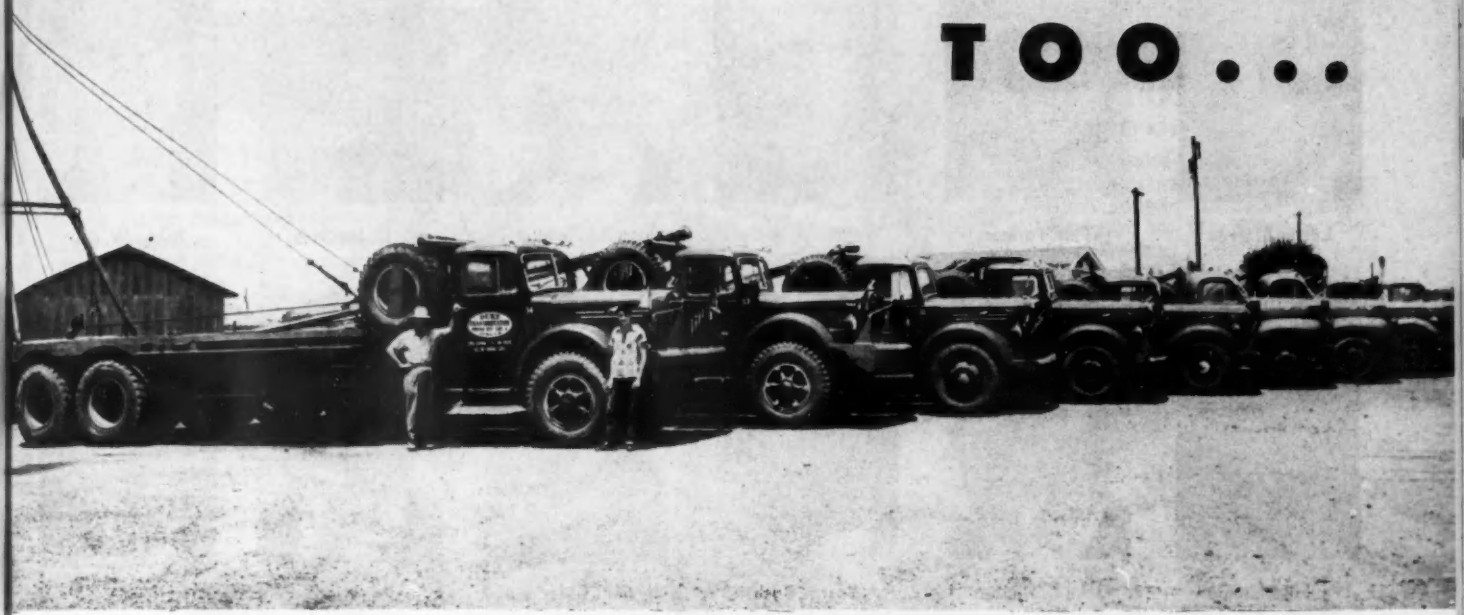
SOLD THROUGH SUPPLY STORES EVERYWHERE

(CUTAWAY)

Oil States

OIL STATES RUBBER CO.
ARLINGTON, TEXAS

MUDDERS AND FAST HAULERS, TOO...



Mr. J. C. Duke, owner, and his son alongside the fleet of Macks used by Duke Transportation, Jena, La., for both heavy oil field and over-the-road hauling jobs.

Macks turn in outstanding performance 12 months of the year — both on and off highway

Here's what Mr. Duke writes:

"We operate oil field transportation equipment in an area that we consider the most unusual and roughest in Louisiana. This area, west of Natchez, Mississippi, is under water from late fall to early summer every year. Drilling rigs move in when the water moves out. No roads are built until oil comes in, which means that our trucks must haul heavy loads in and out of deep mud to supply drilling operations.

"In our constant search for heavy duty trucks that would work under these difficult conditions in the oil fields five months out of the year, and during the remaining seven months compete on over-the-road hauling jobs, we have used trucks of many makes and models.

"In 1950, we purchased our first Mack. Since then we have added 10 more heavy-duty Macks because we've found that they can be depended upon to turn in top performance on every job. Large or small, our Macks give us the speed, ease of operation, fuel economy, versatility and long service life that enable us to equal or better our over-the-road competition. And of course Macks are in a class by themselves when the going's rough and muddy."

Here's why Macks deliver such outstanding performance:

- Mack's famous Balanced Bogie and exclusive Power Divider deliver torque to each wheel in proportion to its traction. Macks are the trucks that don't mire in when mud is extremely heavy.
- Mack's Thermodyne® Diesel engine is unsurpassed for fuel operating economy.
- Mack's rugged construction and ready accessibility are among the many features that add up to outstanding performance and easy maintenance even on the toughest jobs.

Let your Mack Branch or Distributor give you complete details. Mack Trucks, Inc., Plainfield, N. J. In Canada: Mack Trucks of Canada, Ltd.

MACK
first name for
TRUCKS

3902

What's Happening

AMONG SERVICE AND SUPPLY MEN

Lester B. Swan

T. H. Farmer

Weldon D. Willes

Russell L. Sylvester

J. O. Hankins

Bobby W. Gill

Paul S. Chapman

John B. Hughes

George Bush

John C. Madden

J. E. Brown

J. T. Tucker

Lester B. Swan, general manager, Brazos Oil and Gas division, **Dow Chemical Company,** Houston, has been elected to the Dowell Incorporated board of directors. Swan joined Dowell in 1940 as a junior engineer. After serving in various field positions, he was transferred to Dowell's general offices as a development engineer. When the company expanded its Gulf Coast operations in 1947, Swan became assistant district manager at Houston and district manager at New Orleans a few months later. Subsequently, Swan became vice president and general manager of Dowell's Latin American associate company, United Oilwell Service S. A., with headquarters in Caracas, Venezuela. He held this position until 1952 when he rejoined Dowell at Tulsa as assistant general manager and coordinator of research. In 1953 Swan joined another Dow Chemical Company subsidiary, Brazos Oil and Gas Company.

•

T. H. (Tommy) Farmer has been appointed northern New Mexico district manager of the **McCullough Tool Company,** with headquarters in Aztec. Farmer joined McCullough in 1945 and has had wide experience in various sales and service capacities. Prior to this appointment he was sales manager of their West Texas district sales with offices in Midland. Joining Farmer in Aztec is **C. D. Hendricks,** sales engineer. Hendricks has had over three years experience in sales and service at Odessa, Texas.

•

Weldon D. Willes, product manager—Nordstrom valves, **Rockwell Manufacturing Company,** has been named assistant to the president of Rockwell's recently acquired Locomotive Finished Material (LFM) division, Atchison, Kansas. Willes' chief assignment will be the coordination and integration of Rockwell products into existing LFM production. He joined the Rockwell-Nordstrom sales force in 1947 and later served as works manager at the Oakland plant until he was named Barberton, Ohio, general manager. **Russell L. Sylvester,** formerly with New York Air Brake Company, has joined Rockwell as chief engineer of its Central Valve Research and Development department. A registered professional engineer, Sylvester spent a number of years as director of project engineering, Kinney Manufacturing Company (division of New York Air Brake). He was also manager of engineering, National Research Corporation.

•

J. O. Hankins has been promoted to Oklahoma and Kansas district manager for **Byron Jackson Tools, Inc.,** a subsidiary of Borg-Warner Corporation. Hankins began his service with Byron Jackson ten years ago, working in both production and sales in Los Angeles. From there he went to West Texas where he held the position of sales representative. He was later transferred to Tulsa.

•

Bobby W. Gill was recently appointed representative for **Foster Cathead Company** in the North Louisiana, East Texas, Arkansas area. Gill has his headquarters in the Tri-State Specialty building in Shreveport. He has been with Foster Cathead Company of Wichita Falls, Texas, for the past four years. He served first as shipping and receiving clerk, and later as parts department manager, and factory and field service man, for both catheads and tubing tongs. Prior to joining Foster, he was a roughneck in the Clay County, Texas, oil fields.

•

Paul S. Chapman, former district manager of the San Francisco office of **Johnston Pump Company,** has been elevated to the position of manager of industrial sales for that company. Chapman comes to this new position with a wide background of pump experience and has been employed by Johnston since 1951.

•

John B. Hughes was appointed Joaquin division manager of **Medearis Oil Well Supply Corporation.** He has serviced the Valley area for the Medearis organization for ten years prior to 1952. In 1952 he went in business for himself in South Dakota as a manufacturer's agent.

•

George Bush has been promoted to sales division manager of the South Central Sales division of Cleco Air Tool division of **Reed Roller Bit Company.** This sales division includes six southwestern states. Bush, who has been with Reed since 1941, has worked as a tool maker, inspector, engineer and salesman, before this promotion. He was transferred to the Cleco division in 1950. He replaces **E. W. Clayton,** who has been promoted to manager of Sales Development for Cleco.

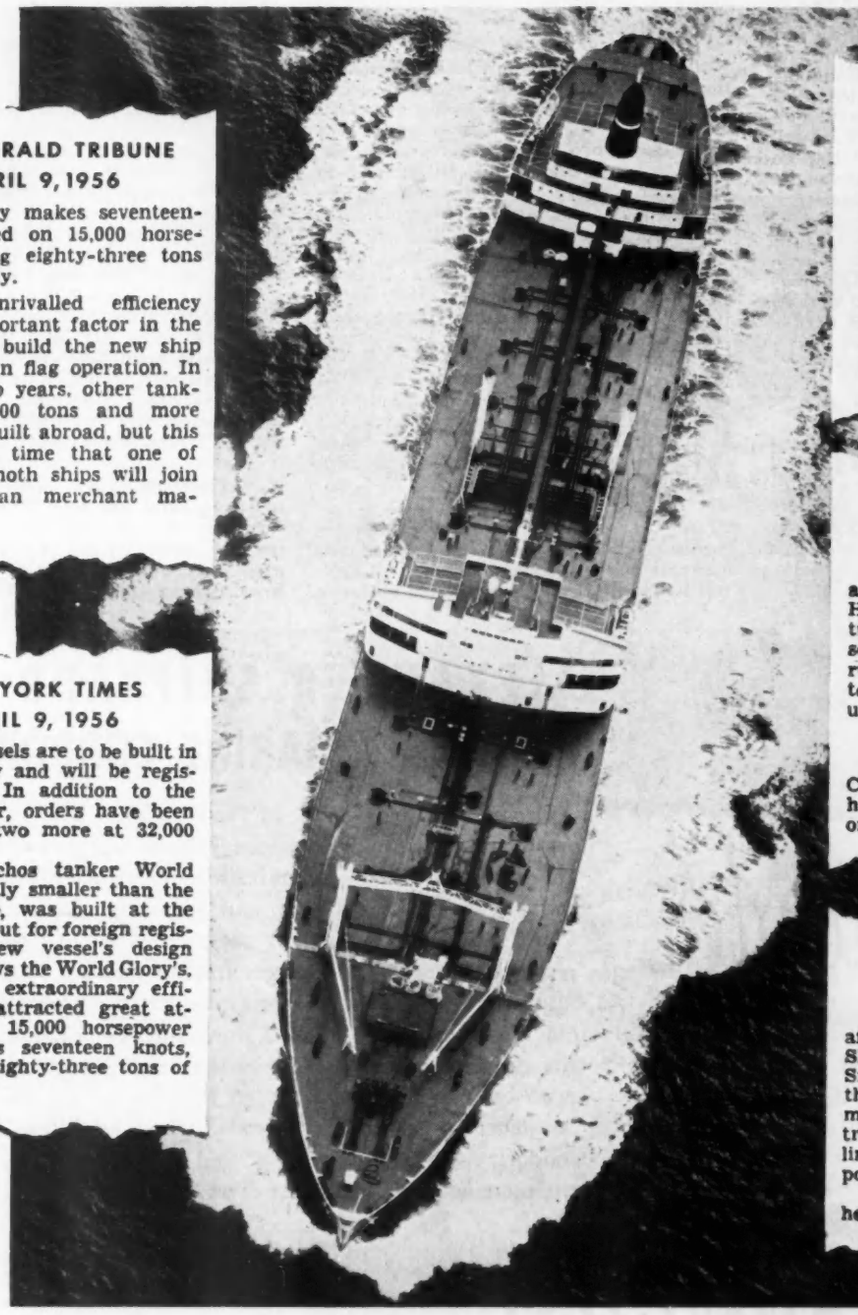
•

John C. Madden has been appointed division tubular manager of the Export division of **The National Supply Company,** with headquarters in New York City. Madden joined the Spang-Chalfant division of National Supply in 1952 as a sales representative in the New York office. He was later promoted to assistant district manager.

enable us to equal or better our over-the-road compe-

What the Press says about the Tanker "WORLD GLORY"

DESIGNED, BUILT, TURBINED BY BETHLEHEM



N. Y. HERALD TRIBUNE
APRIL 9, 1956

World Glory makes seventeen-knots loaded on 15,000 horsepower, using eighty-three tons of fuel daily.

"This unrivalled efficiency was an important factor in the decision to build the new ship for American flag operation. In the last two years, other tankers of 45,000 tons and more have been built abroad, but this is the first time that one of these mammoth ships will join the American merchant marine."

NEW YORK TIMES
APRIL 9, 1956

Three vessels are to be built in this country and will be registered here. In addition to the super tanker, orders have been placed for two more at 32,000 tons each.

The Niarchos tanker World Glory, slightly smaller than the present ship, was built at the same yard, but for foreign registry. The new vessel's design closely follows the World Glory's. The latter's extraordinary efficiency has attracted great attention. On 15,000 horsepower she develops seventeen knots, using only eighty-three tons of fuel a day.

N. Y. HERALD TRIBUNE
APRIL 17, 1956

The 46,000-ton tanker will be slightly larger than the World Glory built by the same Bethlehem yard for Mr. Niarchos who is operating it under the Liberian flag. The World Glory has established a remarkable record since she went into service two years ago for reliability and economy of operation.

NEW YORK TIMES
AUGUST 26, 1954

The World Glory is very fast afloat and smooth in operation. Her 15,000-horsepower turbines turned out speeds in excess of seventeen knots in all-out trial runs last May, and she managed to better sixteen knots while using only 12,000 horsepower.

Master Is a Veteran

The master of the World Glory, Captain Corcacas said she had handled "like a baby carriage" on her initial trip.

NEW YORK TIMES
MAY 4, 1954

After the vessel docked shortly after 2 P. M. at the Boston Naval Shipyard in East Boston, Captain Smith praised the performance of the tanker, the second largest merchant ship built in this country. The 53,000-gross-ton superliner, United States, built at Newport News, Va., is the largest.

"She performed marvelously," he said.

SHIP REPAIR YARDS

Boston Harbor — New York Harbor
Baltimore Harbor — Beaumont, Texas
Los Angeles Harbor — San Francisco Harbor

SHIPBUILDING YARDS

Quincy, Mass. — Staten Island, N. Y.
Sparrows Point, Md. — Beaumont, Texas
Terminal Island, Calif. — San Francisco, Calif.

BETHLEHEM STEEL

Shipbuilding Division

GENERAL OFFICES: 25 BROADWAY, NEW YORK 4, N. Y.

On the Pacific Coast shipbuilding and ship repairing are performed by the Shipbuilding Division of Bethlehem Pacific Coast Steel Corporation

J. E. Brown has been named district manager for the Pawhuska, Okla., district by **Welex Jet Services, Inc.** Brown has been with Welex seven years, having started as a rigman and held subsequent positions as shooter, sales engineer and assistant district manager. Prior to joining Welex, Brown was with another oil field service firm.

•

J. T. (Tommy) Tucker was appointed general manager of sales of the **Cardwell Manufacturing Company,** Wichita, Kansas. He was formerly general manager of sales of Emsco Manufacturing Company at Houston, vice president in charge of sales at Unit Rig and Equipment Company, Tulsa, and most recently, was vice president in charge of sales at George E. Failing Company, Enid, Okla. At Cardwell, Tucker will be responsible for the coordination of sales activities for the manufacturing firm's direct sales organization.

•

Robert Isham, Jr., assistant finance manager of **Weatherford Oil Tool Company,** has been elected to the Oil Field Services & Supplies Industry committee of the National Association of Credit Men for the coming 1957 Credit Congress to be held May 12-16 in Miami Beach, Fla.

•

Herbert F. Byrne was appointed vice president of production planning and **Louis J. Rohl** vice president and chief metallurgical engineer of **United States Steel Corporation.** These are both newly created positions. **Joseph M. Greer** was promoted to general manager of production planning for the corporation.

W. O. McCarthy

Dale DeLong

Well Equipment Manufacturing Corporation, division of Chiksan Company, has appointed **W. O. McCarthy** as personnel director. For the past four years, he has been supervisor of personnel for the Chiksan Company, Brea, Calif. In addition to his other duties, McCarthy will be responsible for obtaining the additional technical and skilled personnel necessary to staff the expanding facilities now under construction in Houston. **Dale DeLong** has been appointed sales representative in the Southern Louisiana area for the company. DeLong was formerly sales representative in the same area, with headquarters in Morgan City for a rock bit manufacturer. He will have his headquarters in New Orleans where he replaces **L. L. Durkin** who has been transferred to the newly created position of city sales in Houston.

•

Crane Co. has announced three appointments: **Thomas D. Kelly** has been named manager of the Midwest district, and **Darrell R. Nordwall** has been named manager of the East Coast district. New manager of valve and fitting sales is **Charles H. Lovelace.** Lovelace, formerly manager of Crane's Detroit branch, joined the company in 1938. He worked in oil industry sales at Chicago and at branches at Shreveport and Memphis. In 1947 he was appointed assistant manager at Memphis, and in 1954, manager at Detroit. Kelly moves up from the managership of Crane's Chicago branch. He joined the company in 1927. In 1945 he was named manager of the East Chicago, Ind., branch, and in 1953 became manager at Cleveland. Two years later he returned to Chicago as manager. Nordwall, formerly manager of Crane's Los Angeles branch, joined the company in 1932. After service in the plumbing and heating department at Crane's Chicago general office, he became a sales department manager at Crane's New York branch, later serving as export field sales representative, export sales manager, and assistant branch manager. In 1953 he became New York branch manager, and a year later was transferred to a similar post at Los Angeles.

•

Ralph Nation has been named vice president and sales manager for the newly formed **National Services, Inc.,** which is comprised of National Mud Service Company, National Cores, Inc., and National Testers, Inc. The company's headquarters are in Oklahoma City.

•

H. R. Godfrey, Jr. was appointed assistant to the general manager of **Allis-Chalmers General Products** division. Godfrey has been a specialist in the chemical and petroleum section of the company's New York district office since 1951. Prior to

A reminder

ALEXANDER SHIPYARD NOW AMERICAN MARINE CORPORATION

Alexander Shipyard, Inc. of New Orleans is moving forward under a new name, American Marine Corporation, with the announcement of a reorganization-expansion program to meet the growing shipbuilding and servicing needs of the Gulf Coast area. The expansion program is in full progress with recent additions of a new gas freeing plant, a 1500 Ton floating drydock, a 50 Ton floating derrick, and a new 16 ft. 600 Ton hydraulic press for forming steel plates. As a result the American Marine Corporation becomes equipped to do an even better job than its noted fore-runner in the design and construction of offshore and inshore drilling barges and tenders, tugs and work boats; and in the servicing, repair, and maintenance of all types of river and Gulf marine equipment.

AMERICAN MARINE CORPORATION

The company continues under the same active management. It remains dedicated to provide for the expanding needs of the Gulf Coast Area in the design, construction, and servicing of marine equipment.

P. O. Box 8126 New Orleans 22, La. VA. 2408

that he was an assistant engineer in the centrifugal pump department for several years. Godfrey joined Allis-Chalmers in 1948. **J. C. Baseheart** is the new engine sales manager, and **F. M. Borwell** is assistant engine sales manager of the Buda division, Tractor group, Allis-Chalmers. Baseheart was in charge of engine sales and Borwell was special district representative, engine sales, for the Buda division, Harvey, Ill.

Marion Hightower

Clifford E. Anderson

Lufkin Foundry & Machine Company announces the addition of **Marion Hightower** to the sales staff of the Central division. He will headquarter in Hobbs, New Mexico, from which point he will handle all sales and service on Lufkin oil field equipment in New Mexico, as well as the Andrews, Denver City, and Seminole areas in West Texas.

•

W-K-M Manufacturing Company, Inc., has announced the appointment of **Clifford E. Anderson** as chief research and development engineer. Anderson, who has been with W-K-M since January 1, 1956, was formerly senior development engineer with Cameron Iron Works, and for the past two years was an independent consulting mechanical design engineer, specializing in oil industry design problems.

•

Arthur R. Foreman has been appointed comptroller of the **Worthington Corporation** Steam Turbine division at Wellsville, New York. Foreman joined Worthington's Wellsville division in 1951 where he served successively as priority supervisor, assistant purchasing agent and internal auditor prior to his present appointment.

•

Warren M. Benson, vice president and sales manager, **Alten Foundry and Machine Works, Inc.,** Lancaster, Ohio, announces the appointment of **F. F. (Chick) Hunt** as Alten sales service representative for the State of Kansas. In his new capacity Hunt will coordinate Alten sales, service, and merchandising activities through supply stores in the Kansas area. He brings to Alten a wide experience in the oil field equipment industry.

•

Dodge Manufacturing Corporation announced a number of promotions and changes of management personnel. **Carl W. Petersen** was elected executive vice president. He was previously vice president and works manager. In 1924 he joined the Dodge organization. **Earl Wedlake** was elected vice president in charge of production and purchasing. He came to Dodge in 1940 from the Aircraft division of Bendix Aviation Corporation in South Bend and was made director of purchases. Later he also assumed the duties of production manager. **Karl D. Jahnke** was promoted to the offices of secretary and treasurer to succeed **Temple Williams** who retired. He also succeeds Williams as secretary and treasurer of Chicago Thrift-Etching Corporation, the Dodge subsidiary. Williams remains a member of the Dodge board of directors and chairman of the Finance Committee of the board. **Lloyd F. Lamm,** who has been since 1944 vice president and general manager of Chicago Thrift-Etching Corporation and its predecessor, was elected president of the subsidiary company. **J. E. Otis, Jr.,** president of Dodge, was elected chairman of the board. Lamm, has been a member of the Dodge organization since 1915, first as an effective member of the Dodge Chicago district sales staff, and then as the district sales manager. When Dodge purchased the Etching Company of America in 1944, Lamm was elected its vice president and general manager, and upon the acquisition by Dodge of Chicago Thrift Company and its merger with Etching Company of America, he continued in direct charge of the combined operations.

Republic National Bank Establishes Oil Division

The Republic National Bank of Dallas has established an oil division in the Trust department to permit specialized handling of estates and trusts whose assets include petroleum interests. Heading this newly created division in the Trust department will be George E. Wilkin, Jr. Operation of the Trust department's new oil division will be entirely separate and independent of the bank's Petroleum department.

In 1948 Wilkin joined the staff of the American Liberty Oil Company, where he

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served as senior petroleum engineer until he was placed in charge of the Production department of Twin Oil Corporation. Twin Oil merged into the Drilling & Exploration Company in 1955, and Wilkin remained with this firm until his appointment to Republic's staff this year.

John Munro

T. J. Howard

Applied Power to Distribute Allis-Chalmers, Buda Engines

A new corporation, Applied Power Equipment & Manufacturing Company, was formed recently by former officials of Buda Engine and Equipment Co., Inc., (subsidiary of Allis-Chalmers Manufacturing Company) to take over exclusive distribution of Allis-Chalmers and Buda engines in South Texas. Main office is in Houston with a branch in Alice.

Officers of the new corporation are John Munro, president; Thomas J. Howard, vice president and sales manager; A. H. Benson, general service manager and W. C. Dvorak, secretary-treasurer.

Four-Service Oil Field Company Organized to Supply Drillers

National Mud Service Company, National Cores, Inc., and National Testers, Inc., have joined to form National Services, Inc., it was announced this week by J. Fred Hill, president, and Ken Kendricks, executive vice president, of the new corporation.

The company will supply drillers with the four coordinated services of mud, diamond coring, core analysis and drill-stem testing from one source.

Headquartering in Oklahoma City, the new company will serve the drilling industry from 23 locations throughout Oklahoma, Texas, Kansas and New Mexico. W. J. Daiker is secretary-treasurer of all National companies.

Wedgeplug Valve Company Moves to Birmingham

Wedgeplug Valve Company, an affiliate of Stockham Valves & Fittings, will soon move its entire operation to the Stockham Plant in Birmingham, Ala.

The objective is to obtain larger production and other facilities for their product, Wedgeplug non-lubricated steel plug valves.

Alexander Shipyard Becomes American Marine Corporation

Alexander Shipyard, Inc., of New Orleans has changed its name to American Marine Corporation, with a reorganization and expansion program designed to meet the increasing shipbuilding and marine servicing needs of the Gulf Coast area. The reorganization of the company was undertaken through the investment banking firm of Reinholdt and Gardner of St. Louis, with the Alexander family relinquishing its interest following the death of Lester F. Alexander, founder of the shipyard and long time proponent of the Tidewater Canal.

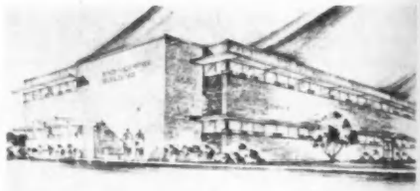
The president of the new American Marine Corporation is Leslie B. Durant, formerly vice president and general manager of Alexander Shipyard, Inc. H. E. Breit, Jr., for many years chief engineer, is vice president of the reorganized company. Joining the staff as assistant vice president is W. H. Michel, formerly in charge of research and development with Gibbs and Cox, Inc., naval architects of New York City.

Three Graduate Fellowships Granted by Companies

Grants totalling $11,600 from three industrial firms to support graduate fellowships in chemistry at Lehigh University were announced by Elmer W. Glick, university treasurer. Recipients will be selected by the university for the coming year to work with Dr. Earl J. Serfass, head of the Department of Chemistry.

A grant of $6000 to establish a graduate fellowship in the general study area of physical chemistry has been received from the United States Steel Foundation. This is to cover the university costs and stipend of the person selected during the next two academic years. The second award to the university is from the Armstrong Cork Company. It will provide $3100 tuition and stipend for the student and a grant-in-aid to the university.

A $2500 grant plus tuition costs will be made under the agreement by the Union Carbide and Carbon Corporation.



Schlumberger Corporation To Enlarge Plant by June

Construction is to begin immediately on a two-story building for the Schlumberger Well Surveying Corporation which will double the firm's engineering laboratory and office facilities.

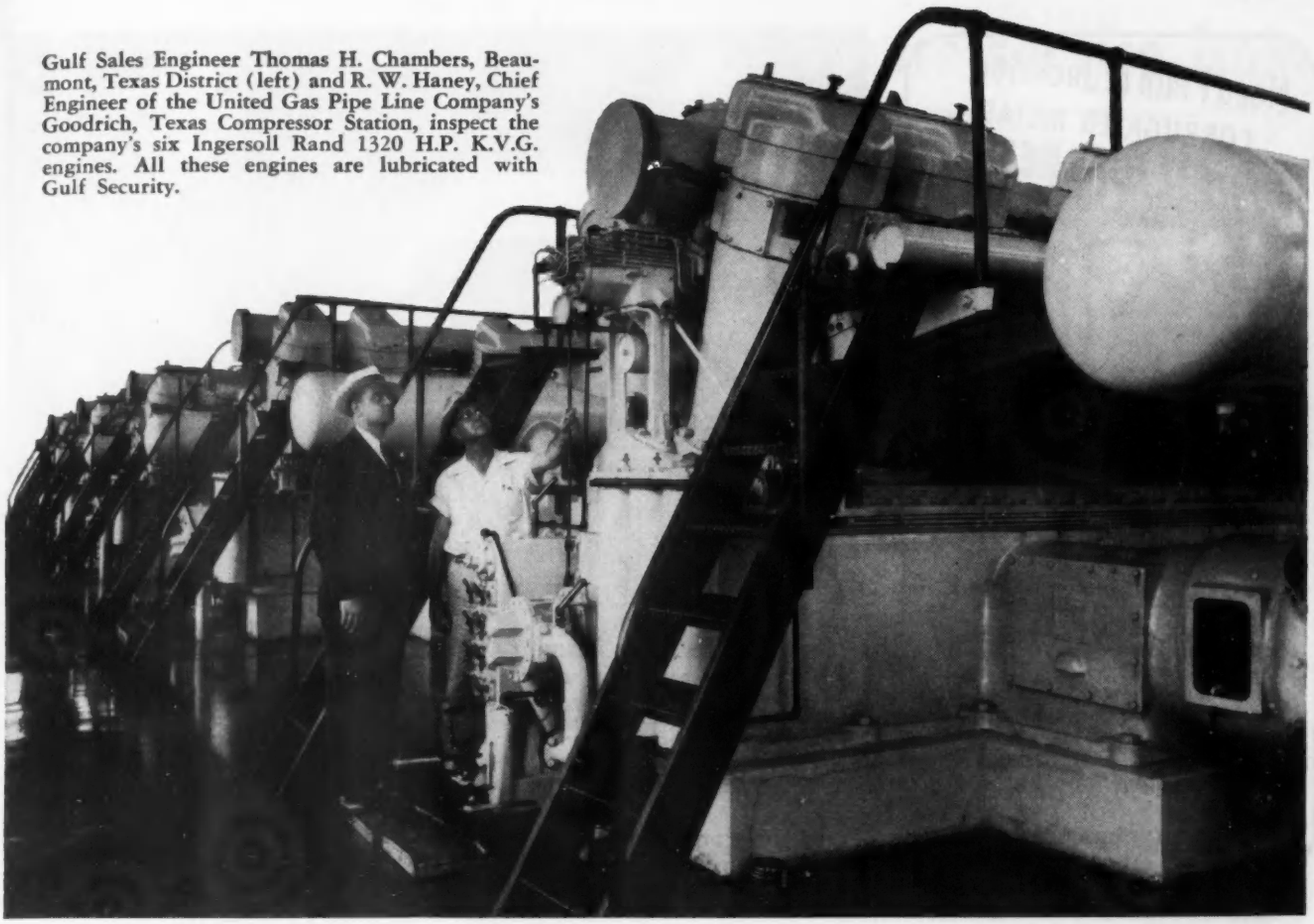
A high pressure testing lab is planned where conditions of heat and pressure equal to those found in a 30,000-foot oil well can be duplicated. In four test chambers, surveying instruments will be tested in pressures up to 30,000 pounds and temperatures up to 450° F.

Slated for completion by June 1, 1957, the project will be the ninth building at the company's plant site in Houston.

Byllesby Company Acquires Maloney-Crawford Tank

The Maloney-Crawford Tank & Manufacturing Company of Tulsa, manufacturers of bolted and welded steel tanks, oil and gas separators, emulsion treaters, dehydration units and pressure vessels, has been purchased by H. M. Byllesby and Company of Chicago, Ill.

Management, personnel, and policies of Maloney-Crawford Tank & Manufacturing Co. will be maintained.



Gulf Sales Engineer Thomas H. Chambers, Beaumont, Texas District (left) and R. W. Haney, Chief Engineer of the United Gas Pipe Line Company's Goodrich, Texas Compressor Station, inspect the company's six Ingersoll Rand 1320 H.P. K.V.G. engines. All these engines are lubricated with Gulf Security.

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Oil Field Supply Co. Named Distributor

Gulf Tool Company of La., Inc., with stores in Harvey and New Iberia, La., announces the appointment of Oil Field Supply Company, Citronelle, Ala., as distributor in that area. Gulf Tool, organized approximately two years ago, handles sales and rentals of Gulf Tool Company, Inc., Johns-Manville Sales Corporation, and B&W Metals Company, products for oil field and industrial uses. At the left is G. W. Morrison, vice president and general manager of Gulf Tool, and W. A. Lawshae of Johns-Manville is at the right.

Bowen-Itco Formed By 2 Houston Firms

BOWEN-ITCO is the new name of an organization formed by the combining of two Houston firms—**Bowen Co. of Texas, Inc.,** and **ITCO International, Inc.** The two companies had been associated, with the Bowen Co. of Texas manufacturing Bowen and ITCO tools and distributing these products in domestic trade, and ITCO International marketing ITCO and other product lines in export. An expansion of the company's export activity is anticipated.

BOWEN-ITCO's predecessor in the manufacture and domestic distribution of oil field specialties, the Bowen Company of Texas, Inc., was founded in Houston in 1935. One of the firm's founders, the late Walter Bowen, was the inventor of the Bowen Overshot. The company also has pioneered in the development of hydraulic rotary jarring tools and wire line tools for permanent completion operations.

At present BOWEN-ITCO maintains 20 branches in 11 states, Canada, and Venezuela.

Lebus Tool Reorganizes, Plans Expansion Program

F. L. Lebus and F. L. Lebus, Jr. announced the liquidation of the Lebus Rotary Tool Works and the organization of two new Lebus companies.

The Lebus International Engineers, with F. L. Lebus, Jr., as manager will be one of the new Lebus Corporations. The other will be the Lebus Manufacturing Company, and will be a subsidiary of the American Hoist and Derrick Company of St. Paul, Minn., which has acquired the present Lebus plant and facilities for the manufacture of Lebus dropped forged truck tools and wire line accessories. Lebus International Engineers, Inc., will build a new plant to expand the operations of its wire line spooling services, telescope drill joints, fishing tools, and other oil field tools planned for the immediate future.

An expansion program also is planned by the American Hoist and Derrick Company for its Lebus Manufacturing Company.

Power Machinery Company Appointed ALCO Agent

ALCO Products, Inc., and the Power Machinery Company of Tulsa and Kansas City jointly announced the appointment of Power Machinery as exclusive manufacturer's agent in Oklahoma and Kansas for ALCO oil field equipment.

Power Machinery Company last year was appointed by ALCO exclusive agent in Kansas, Oklahoma, Texas and Louisiana for the ALCOTWIN line of fin-tube heat exchangers.

Under the new agreement, Power Machinery will handle the complete line of ALCO oil field equipment built at the latter firm's Beaumont, Texas, plant, the former Beaumont Iron Works.

The ALCO product line at Beaumont includes manufacturing and expanded warehouse facilities for drilling and production equipment, ALCOTWIN heat exchangers, flanges and other rolled-steel products. Also handled from Beaumont are ALCO's new diesel-electric drilling rig power package and pipe line pumping and auxiliary power diesel engines.

ALCO is engaged in a $1½ million expansion program at its Beaumont plant. The construction, which will be completed in the near future, includes a combination warehouse-office building together with an expansion of manufacturing facilities.

Emsco Signs Agreement With Italian Company

Stabilimenti Meccanici Di Pozzuoli of Naples, Italy, a firm of the Finmeccanica Group, has signed an agreement with Emsco Manufacturing Company of Los Angeles for the construction of oil well

drilling rigs and component parts. These rigs will be sold throughout the world by Continental Supply Company of Dallas, which holds exclusive selling rights.

This agreement will enable Stabilimenti Meccanici Di Pozzuoli to supply Emsco equipment to the Italian market where the demand for oil well equipment is steadily rising, as well as to all the other world markets.

C. Ray Hudson

Claude Cox, Jr.

C. Ray Hudson will head Christensen Diamond Products Company's new Gulf Coast division in Houston. Claude Cox, Jr., is the new Mid-Continent division manager with headquarters in Midland, Texas.

Todd Shipyards Completes Offshore Drilling Platform

A 133-foot by 112-foot self-contained offshore drilling platform to be installed in 90 feet of water off the coast of Louisiana, South Timbalier Parish, approximately 25 miles offshore from the Bell Pass area, was recently completed by the Products division of Todd Shipyards Corporation at Houston for J. Ray McDermott & Co., Inc., of Louisiana and Texas.

The structure, fabricated in five basic units, and consisting of three deck sections and two jackets, used approximately 850 tons of steel, and required precise planning to insure accurate fit of the parts when the platform was finally erected some 200 miles from the shipyard. To accomplish this, all pre-cut members of the structure were sub-assembled and fabricated. Final fabrication was done with the sub-assembled units set on skids. Since some of the units weighed over 200 tons, they were too heavy for lifting with gantry cranes, and so required a carefully-planned and skillfully-executed operation to skid them onto the barges for shipping.

Otis Engineering Acquires Cummings, Inc., of Houston

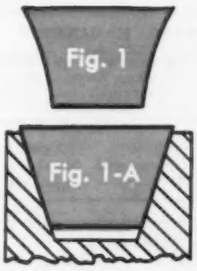
Otis Engineering Corporation, Dallas, manufacturing affiliate of Otis Pressure Control, Inc., has announced the purchase of Cummings, Inc., Houston, manufacturers and distributors of Cummings gas lift valves.

The Cummings firm in 1952 developed a completely new basic operating principle for gas lift equipment by using a pressurized valve with a resilient sleeve, which eliminates moving metal parts, metal-to-metal seats, and bellows used in conventional valves.

All Cummings, Inc., employes, including Les L. Cummings, the Houston firm's president, would be retained in the Otis organization. Cummings has been named manager of the Gas Lift division for Otis in Houston.

Otis purchased all of the patent rights of the Cummings firm and plans to manufacture; market, and service the gas lift equipment under the Otis name.

Why you get more service from V-Belts with CONCAVE SIDES



Each sidewall of a Gates V-belt is concave (Fig. 1)—a precisely engineered curve that makes V-belts last far longer.

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Uniform wear lengthens belt life; keeps costs down.

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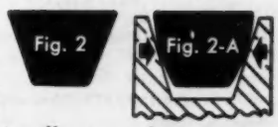

Bend a straight-sided belt (Fig. 2). The sides bulge at the bend causing uneven contact in the pulley groove (Fig. 2-A). Naturally, wear is greater at points indicated by arrows. Result: shorter belt life, increased belt costs.

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LEASES

NEW MEXICO State and Government Oil Leases. Various Blocks, 40 acres $125. Free Map. Box 112-W, World Oil, Houston, Texas.

A. B. Crossno has been appointed division tubular manager of the Northwest division of **The National Supply Company.** He succeeds **C. L. Bainter,** who has retired. Crossno joined the company in 1948 as a field salesman at Casper, Wyo. Later he served as store manager at Sidney, Neb., and as assistant district manager at Casper. He has been tubular sales representative at the division headquarters in Denver since 1954.

•

Schlumberger Well Surveying Corporation assignments involving the West Coast, Louisiana, Kansas and Texas have been announced.

George D. Volkel has been named manager of the Long Beach district. Formerly, he served as assistant to the Pacific Coast area manager and district manager in both King City and Coalinga. Volkel has worked in California since joining Schlumberger in 1948.

Thomas C. Nicholls has been promoted from field engineer to location manager at Donaldsonville, La. Nicholls joined Schlumberger in 1950 and has worked in several Louisiana locations.

Delbert D. Carlin has been appointed field sales engineer for Schlumberger at Liberal, Kansas.

E. S. Muller has served Schlumberger as a field engineer since 1954. He has recently been appointed field sales engineer for the Pampa, Texas, district.

•

Vernen A. Tredinnick, who has been manager of **Walworth Company's** Kewanee, Ill., works, has been promoted to the recently established position of assistant vice president in charge of inventory planning and control. **Arthur C. Wadsworth** now manager of the company's East St. Louis works has been advanced to manage the larger Kewanee plant.

Tredinnick will make his headquarters at the company's general offices in New York City. Wadsworth will move to Kewanee.

•

Raybestos-Manhattan, Inc., announces the following executive appointments: **J. Stewart Munro,** to president of the Canadian company and **Douglas Pocock** to the newly-created post of vice president, Replacement Sales.

Munro joined Raybestos-Manhattan (Canada) Ltd. in 1941 as plant engineer and has advanced through many positions including those as chief engineer, assistant general manager and vice president. As president, Munro succeeds Robert Abbott who, although in retirement, will remain as a Canadian director of the company.

Pocock joined Raybestos-Manhattan (Canada) Ltd. in 1920, and has held the post of sales manager since 1940.

•

Cameron Iron Works has named **O. L. Lorehn** coordinator of supply and manufacturing, and **I. M. Baker** as coordinator of sales in the International division. Offices of both executives are to be maintained in Houston. **R. E. Hager** has been named manager of Cameron Iron Works of Canada to succeed **Gene Teer** who is being transferred to Houston to manage the Houston office of the International division. **E. L. (Buck) Barker** has been appointed to the position of manager of the division of Mexico and will office in Mexico City. The Cameron International division was organized last year to expedite the manufacture, sale, and servicing of Cameron products for operators outside the U. S.

R. G. Kelly

W. D. Owsley

Harry P. Conroy

E. L. Paramore

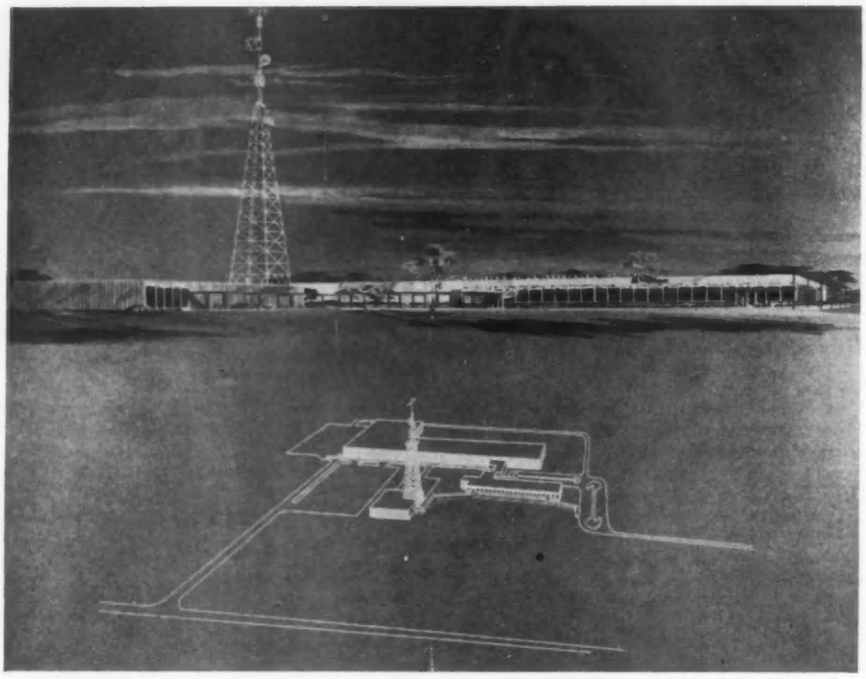
Halliburton Oil Well Cementing Company has announced two new executive positions and executive changes. **R. G. Kelly,** formerly vice president in charge of field operations, and **W. D. Owsley,** formerly vice president for engineering advice to management, have been elevated to the posts of senior vice presidents. Kelly, a director of the company, began as driver of a cementing truck in 1930. Owsley, who has developed many technical advancements in drilling and producing, joined the company in 1932. Succeeding Kelly as vice president in charge of field operations is **Harry P. Conroy,** fomerly northern region vice president. In his new post Conroy will supervise the company's domestic field operations, which are administratively divided into three regions. **D. R. Yager,** regional vice president, was assigned the central region and **Hosea P. Hearn,** regional vice president, was assigned the northern region. The southern region was assigned to **E. L. Paramore,** formerly manager of Halliburton's South Louisiana division.

•

Erwin Bernstein has been appointed mobile communications engineer of Bendix Radio division of **Bendix Aviation Corporation.** In his new position Bernstein will be responsible for sales, service and customer relations in connection with Bendix two-way radio communication systems in New Jersey and eastern Pennsylvania. Bernstein has been associated with Bendix since 1951 and was, prior to his new assignment, supervisor of field operations on the early-warning radar defense net in the U. S.

•

Wallace B. Hunter has been appointed vice president—contracting for **U. S. Steel's** American Bridge division. He began his career with American Bridge in 1920 as a clerk in the Ambridge, Penn., plant. Later he served as assistant contracting manager for American Bridge in their Baltimore office, in the Boston office as assistant contracting manager, and then contracting manager of that office. He was promoted to senior contracting manager of the Chicago office and became senior contracting manager at the New York office.



Garrett Plans Longview Plant

Garrett Oil Tools, Inc., of Longview, Texas, a division of U. S. Industries, Inc., has begun construction of new plant and office facilities on a 39-acre tract in the Longview Industrial district. The facilities will include three buildings with a total of 75,000 square feet of floor space. The manufacturing plant will occupy 57,000 square feet, with the balance devoted to accounting and executive offices and an engineering-research building. The combined facilities, including furnishings and fixtures, will cost approximately $1 million. Completion is scheduled for January 1, 1957.

Fairchild to Use Polar Compass For Jungle Oil Deposit Search

A plane fitted with "polar" navigational equipment soon will begin a pioneering search for oil deposits in the jungles of southern Peru, Fairchild Aerial Surveys announces. The job will be performed by a Fairchild crew flying an AT-11 twin-engined Beech over a wilderness on the east flank of the Andes in behalf of four U. S. oil companies. The area never before has been surveyed for oil from the air.

Because perfect straight-line navigation will be required to obtain an accurate "magnetic profile" of the earth below the jungle, the plane will be equipped with Polar Path, a highly accurate gyro navigational system developed by Bendix Aviation Corporation for commercial flying over Arctic regions where magnetic compasses are unreliable.

Fairchild initially will furnish results of the survey to Socony Mobil Oil Company, Inc., Peruvian Pacific Petroleum Company (Cities Service Corporation and Richfield Oil Company), Gulf Oil Corporation and the Cerro de Pasco Company.

Mid-Continent Opens Store in Venezuela

Newest store opened by Mid-Continent Supply Company is in Anaco, Venezuela, in operation since March. Inset in the photograph are Venezuelan Manager W. M. Day, left, and Store Manager G. S. Durbin. Field salesman at the new location is J. E. Weems; head storeman is W. P. Brandon; and stock control supervisor, A. J. Covaleski.

Failing Company Provides Drill For Greenland Ice Coring Project

For years, weather experts and scientists have been wondering what effect Greenland's mile-thick ice cap has had, and will have, on weather conditions around the world. Now they plan to find out.

Using a special core drill, somewhat similar to those used in oil fields, U. S. Army engineers are boring deep into Greenland's ice covering hoping to come up with the answers to lots of perplexing weather questions. They hope to learn the temperature of the ice cap at various depths, information on the various weather cycles over the past 1000 years, what Greenland was like before it was covered by ice, and various other information.

The drilling is being performed with a skid-mounted model 314 core drill built by the George E. Failing Company of Enid, Okla., (a subsidiary of Westinghouse Air Brake Company), according to Army specifications. The equipment was flown from the U. S. to the Air Force's base at Thule, Greenland, and then transported the last 200 miles by cat-train.

Land and Marine Rental Tools Headquartered in Houston

Land and Marine Rental Tools with headquarters in Houston has been formed. The Company is headed by Leonard W. Phillips as president. Olive Dorrah is vice president and general manager.

Olive Dorrah

The firm's branch rental yard is in Morgan City, La., and is managed by Jack Lubbes.

Land and Marine offers a complete line of new and modern drilling, producing and completion tools for use both on land and in offshore areas.

Rockwell Manufacturing to Build $2 Million Plant in Nebraska

Rockwell Manufacturing Company plans to occupy a new 180,000-square-foot valve manufacturing plant at Kearney, Neb. Company officials estimate the new plant, expected to be completed by midsummer of 1957, will cost approximately $2 million.

Located on a 52-acre plot on U. S. Route 30, the plant will be used for machining, assembly and testing of Rockwell-Nordstrom Hypreseal valves. These valves are primarily used by the oil, natural gas, chemical and chemical processing industries.

Tracerlab Symposium Set This Month in Boston

A three-day symposium on applications of radioactivity in research and refinery operations of the petroleum industry will be held at the Hotel Statler, Boston, October 24 through 26. This is the third in a series of symposia on the industrial applications of radioactivity sponsored by Tracerlab, Inc., and will be followed in 1957 by a related symposium on uses of radioactivity in the exploration and production phases of the petroleum industry.

SPECTRO *log*

The *NEW* Radiant Energy Recording of oil and gas shows while drilling

100 *times*

more sensitive than Wheatstone Bridge and "Hot-wire" methods....

New Spectroscopic equipment combined with new operational techniques and interpretative procedures is now providing information never before obtainable from the gases present in drilling muds.

We will gladly send you full information, technical data, and availabilities without obligation. Just write or call.

Patents pending on equipment and procedure

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ALAMO NATIONAL BUILDING

SAN ANTONIO, TEXAS

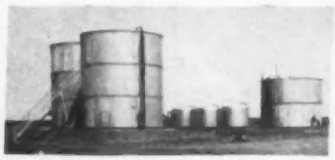
Petroleum Service Main Laboratory and Research Center, San Antonio, Texas

SECONDARY RECOVERY
CABLE ENGINEERING
TECHNICAL CONSULTING
PRODUCTION ENGINEERING
SERVICE, INCLUDING
CORE ANALYSIS

PRESSURE MAINTENANCE WITH GAS OR WATER

REPRESSURING WITH GAS OR WATER

WATER STORAGE TANKS AND FILTERS

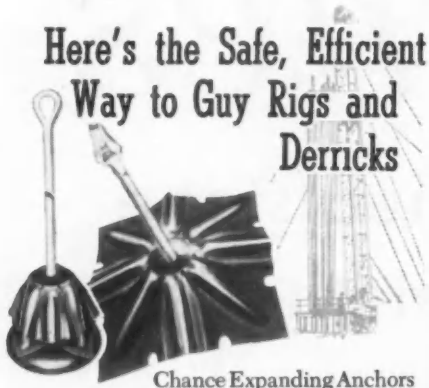


Strawn Sand
Water Flood
Wichita County
Texas

SURVEYS
ESTIMATES
DESIGN
INSTALLATION
SUPERVISION

PETROLEUM ENGINEERS
CABLE ENGINEERING
WICHITA FALLS, TEXAS

Here's the Safe, Efficient Way to Guy Rigs and Derricks



Chance Expanding Anchors are highly efficient anchors where permanent guying is needed for drilling and service rigs and derricks. They can be installed in a fraction of the time required for burying old pipe or setting concrete "deadmen". Installed quickly and easily, the Chance earth anchor will hold up to 30,000 pounds in firm ground.

Write for catalog showing oil industry applications of Chance Earth Anchors.

A·B·CHANCE CO·
CENTRALIA, MISSOURI
TORONTO, ONTARIO, CANADA

SQUEAKS from the BULLWHEEL

"The geologist is back from that wildcat," Mr. Ray. "Yes, you know, the one you forgot all about."

Experiment

The laziest man in the county was conducting an experiment. Lolling in his favorite rocker on the front porch of his little cabin, he would turn his face to the west and rock a little while, then turn toward the south and rock some more. Changing back, the experiment would go on.

"What's the trouble, Eph?" his wife called out, finally attracted by his peculiar manner. "What are ye' movin about so much fur?"

"Jest trying to find out which is the easiest—rockin' east and west with the wind or north and south with the grain in the floor," was his reply.

Mourning

A Hollywood actress who said she was in mourning for her third husband insisted on black olives in her martinis.

Greetings

Vacation telegram to a girl: "Having a wonderful wish; time you were here."

Good Business?

First Inmate: "What are you doing now?"

Second Inmate: "Buying old wells, sewing them up and selling them for post holes."

Wait for Me!

Arriving at a strange hotel, a fussy woman thought she'd better locate the fire escape. She started exploring, opened a door and found herself in a bathroom occupied by an elderly gentleman.

"Oh, I'm sorry," she twitted. "I was looking for a fire escape."

Continuing her search, she presently heard the pad of bare feet behind her. It was the elderly man, clad in a bath towel.

"Wait a minute," he gasped. "Where's the fire?"

Good Business

Sign on restaurant wall: "We have an agreement with the First National Bank—they will serve no sandwiches and we will cash no checks."

Some Wallpaper!

Chancing to meet after many years, the two men stepped into a bar for a few drinks and a lot of conversation. One had become wealthy and after awhile, he invited his friend to see his new mansion. One room surpassed all others. Its walls were of glass and behind the glass were hundreds of brilliant-colored tropical fish.

Awed, but still foggy from the drinks, the friend replied to his host's question: "Yes, it's a wonderful room, but that wallpaper is driving me crazy."

Breakable

A nice old lady was mailing one of the new revised Bibles to her son. "Is there anything breakable in this package?" asked the Postmaster. "Well," timidly replied the little old lady, "only the Ten Commandments."

Child's Prayer

"And please, Lord, can't you put the vitamins in pie and cake instead of in cod liver oil and spinach? Amen."

Game Law

A beautiful girl was being tried for killing her husband. The jurors retired. They knew she was guilty, but they didn't want

Over
60
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McCullough® REPORTS TO THE OIL INDUSTRY

Service
Anywhere Anytime

New Services • • • New Tools • • • New Methods • • • Outstanding Results

M-3 Guns Shoot 1268 Holes in Four Hours

Firing an average of 317 bullets per hour in this shallow Oklahoma well is an outstanding record of perforating speed and efficiency.

McCullough 4¼" O.D. M-3 Bullet Guns fired 1268 improved ½" Ogival Bullets in 7" O.D. cemented casing in two intervals from 1040' to 1064' and from 2762' to 2790'. This was a salt water disposal well. Operator was well pleased.

Speed like this can only be accomplished by experienced, thoroughly trained crews and by using simultaneous firing M-3 Bullet Guns – fastest, most efficient method of bullet perforating available.

M-3's Succeed After Two Others Fail

Two other service companies attempted to perforate this Montana well without success. One was unable to accurately locate the collars and perforated the water zone. The other was unable to do the job because the shots were in dry hole and incoming pressure moved their gun up the hole.

Within 1½ hours, McCullough moved in on the job, located the zone to be perforated, fired 32 improved ½" Ogival Bullets in 5½" O.D. casing between 3955' and 3963' with 3½" O.D. M-3 Bullet Guns, tore down and moved off. Results good – operator happy.

This is just one more example of the accuracy of McCullough measurements and of the value of simultaneous firing M-3 Bullet Guns.

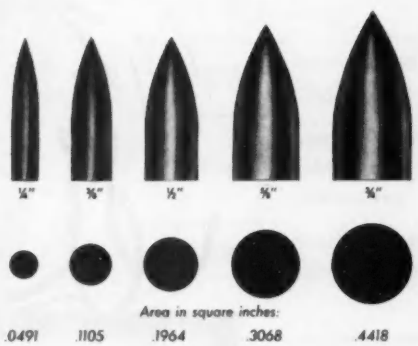
Superior Penetration Pays Off ...Fracturing Job Successful

Hard Shooting M-3 Bullet Gun Permits Successful Completion of Sandfrac Job...Penetrates Tough Formation After Other Bullet Gun Failed.

Previously perforated by another service company, the operator was unable to fracture the formation in this Illinois well; pressures up to 4000 psi were reached without results.

McCullough was called to re-perforate the well with 4⅛" O.D. M-3 Bullet Guns firing improved ½" Ogival Bullets. Twenty shots were fired through 5½" 14 lb. J-55 cemented casing in a five foot interval from 2833' to 2838'.

After perforating by McCullough the well "broke down" at 1600 psi and took fracturing material at the rate of 350 gallons of oil and 700 pounds of sand per minute. This well is now flowing – one of the best in the field – and the entire perforating job, including rigging up and tearing down, required only 1½ hours rig time.



Improved McCullough Ogival Bullets are designed for maximum piercing ability. Type and quality of steel, heat treatment, weight, shape, sharpness of point, etc. are all carefully controlled factors in their production. They are the deepest penetrating bullets known.

Bullet sizes shown above are standard. Burrless caps are available to fit all standard sizes. Special sizes and types, such as the 1/16" and ⅛", are available to meet unusual requirements.

The superior firing power of M-3 Bullet Guns; the deep penetrating qualities of improved Ogival Bullets are particularly valuable where tough, tight formations must be fractured for good production.

There are many jobs like this on record, where the superior penetrating power of McCullough M-3 Bullet Guns has successfully completed the job after others failed. Next time, be sure of results – call McCullough first.

Do you want to see how other oil men have benefited by using McCullough M-3 Bullet Guns? Send for your copy of "RESULTS" – field reports of outstanding jobs successfully completed by M-3 Guns.

See how others have solved their problems! Write McCullough Tool Company, 5820 South Alameda Street, Los Angeles 58, California.

McCullough® TOOL COMPANY

Cable Address: MACTOOL

LOS ANGELES
HOUSTON
EDMONTON

(For more data on advertised products, use Readers' Service blue cards, last page this issue.)

"Ye cannae' scare me— I'm guarded by McKissick."

McKISSICK

SAFETY FLOOR BLOCK

A Sure Performer

Latch Type becket may be "latched" into tie-down without removal from block.

Also available with patented adaptor and base plate, permitting block to sway laterally with line movement

McKISSICK

McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

WORLD OIL

"Since our drilling rates are too high, we're contracting our own venture to another outfit."

to sentence her because of her beauty—yet they feared to face their wives if they didn't. Finally, one of them happened to remember that the dead man had been an Elk. They passed this sentence: $20 fine for killing an Elk out of season.

Great Fun

Latest innovation in home building is a small pool in the living room instead of a fireplace. It looks like great fun—sitting around the pool on a chilly evening soaking marshmallows.

Fast Pace

In the old days if a guy missed a stagecoach he was content to wait a day or two for the next one. Today he lets out a squawk if he misses one section of a revolving door.

Last Word

"So you want another day off," snorted the office chief to his helper. "I'm anxious to hear what excuse you have this time—you've been off for your grandfather's funeral four times already this year."

"Today my grandma's getting married again," said the youngster.

Get Lost

Clerk: "Yeah, I've finally decided to get a divorce. You see, I never did love my wife."

Foreman: "Well, that being the case, why in the world did you have eleven kids?"

Clerk: "Oh, I guess it was because I wanted to loose her in the crowd."

Compensations

Dressed in his old gardening clothes, the life-long bookkeeper was puttering around among his lovely garden, when an old dowager lady stopped and spoke to him.

"My good man, I need a gardener for my place which is much bigger than this. I'm prepared to pay you more than you are being paid here, whatever it is."

"Well, ma'am, I kinda doubt it," he answered and with a devilish twinkle in his eye he pointed his pipe stem at the house and said, "You see, the lady in there lets me sleep with her."

ALWAYS IN OPERATION WHEN PUMPS ARE RUNNING

NEW MODEL RUMBA DE-SANDER

ALSO REMOVES SHALE

HUTCHISON MANUFACTURING CO.

6609 AVENUE U HOUSTON 11, TEXAS

announcing.. BJ RED TOP CENTRALIZERS

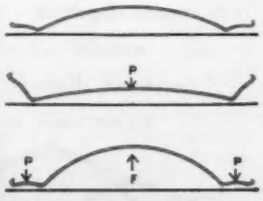
the first really NEW centralizer in years...

Now, Byron Jackson brings you the most advanced centralizer on the market. The exclusive new pre-stressed spring design gives Red Top Centralizers maximum centering force without resorting to heavy "high-bow" springs. Centering force without bulky springs gives better mud and cement circulation. Specify Red Top Centralizers on your next casing job — and your crew will give you a faster, better cement job.

- **NEW** — pre-stressed springs give maximum centering force
- **NEW** — ease of mud or cement circulation . . . no heavy or "high-bow" springs to obstruct flow
- **NEW** — smaller diameter allows easy passage through spider and rotary table — eliminates banding and cutting
- **NEW** — rivetless, weldless construction...no uneven stress pattern or brittleness

Send for new BJ Centralizer Bulletin

HERE'S HOW BJ's EXCLUSIVE PRE-STRESSING WORKS:



1. Spring used in a Red Top Centralizer at rest.
2. If pressure (P) is applied the ends of the spring will rise.
3. Conversely, if pressure (P) is applied to the ends, the spring is "pre-stressed" and exerts force (F) outward.

watch BJ RED for the NEWEST!

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BRAKESOL, Inc.
P.O. Box 9506 Okla. City, Okla.

WORLD OIL

You can't get nothin' on that weevil. He makes sure he does everything right.

Our Song

The couple passed out after a gay celebration, toasting in the New Year. Each fell forward onto the table at one of the better known bistros. Their waiter decided to be thoughtful and put two bottles of alka seltzer on the table. When the fizz started, the man lifted his head and said: "Wake up, darling, they're playing our song."

Reward

Pat was determined to pass by his favorite tavern on his way home. As he approached, he became somewhat shaky, but, steeling himself he passed on. After walking about 50 yards, he turned and said to himself: "Well done, Pat, me boy. Come back and I'll treat ye."

Just Like Television

Uncle, to his six year old niece: "How did you like the church service?"

Child: "I liked the music, but the commercial was too long."

Just Facts, Please

Sailor (at stage door): "Is the hula dancer in her dressing room?"

Watchman: "No, she isn't; she's round at the rear."

Sailor: "Skip the opinions and answer my question."

Not Guilty

The day was rainy and the cellar leaked. Bertram, 5, was having a wonderful time sloshing around in the water when his mother caught him, soaked to the skin. As punishment he was ordered to stay in his room until his pants were dry.

A short time later his mother heard a commotion in the basement.

"Are you down there wetting your pants again?" she bellowed.

There was a long pause and a deep masculine voice replied: "No, Ma'am, I'm just reading the meter."

Basic Requirement

If you have half a mind to get married, go ahead. Half a mind is all it takes.

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SAND AND CEMENT
"Placed by Air"
We have the equipment, personnel and experience to complete any and all GUNITE work regardless of size or location.
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What's New In Equipment

Drilling • Production • Exploration

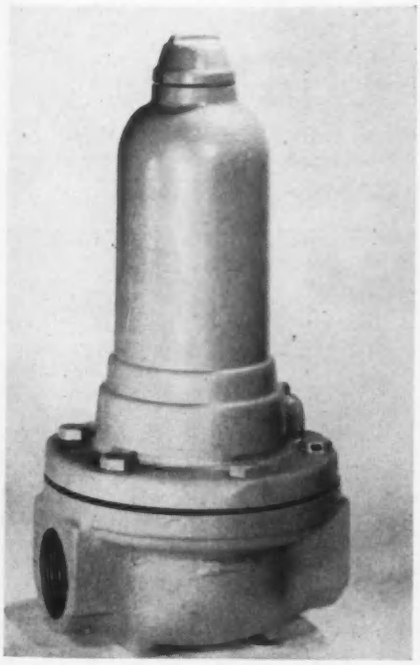
Heavy-Duty Regulator

A new regulator which will withstand momentary overloads as high as 1000 psi on the outlet side has been introduced by Rockwell Manufacturing Company. Designed primarily to provide extra safety for rural gas services—particularly where the gas is piped directly to rural homes from high-pressure pipelines—the new "141" regulator offers the highest capacity in its size range. With a maximum recommended outlet pressure of 400 psi, the "141" operates with a wide margin of safety.

The "141" also offers additional versatility. Four interchangeable orifices and five interchangeable springs enable the regulator to operate on pressures ranging from 3 psi to 400 psi. Changes from one to another of four separate settings in the 3-to-100-psi range are made simply by replacing the spring. For the fifth setting—200 to 400 psi—a reducer plate must be used with the spring. The same diaphragm assembly is used for both low and high pressures.

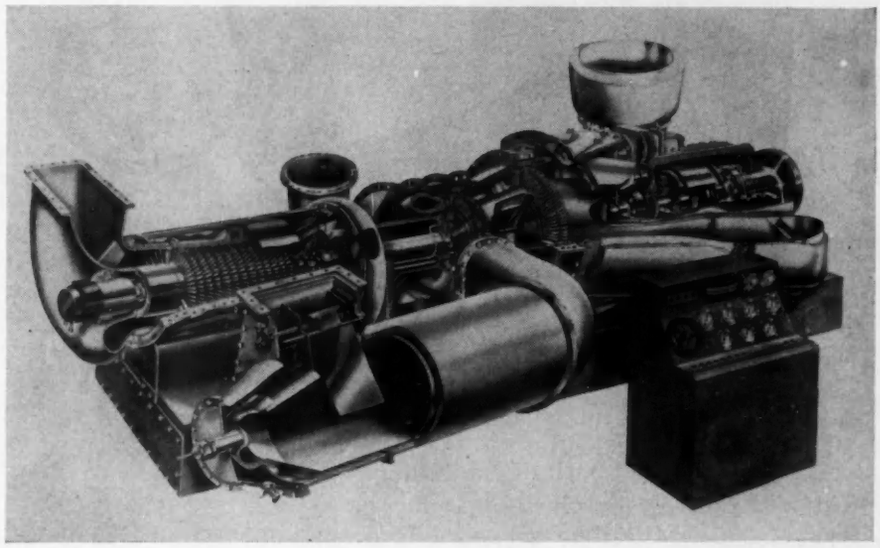
Other features of the new regulator include:

1. Increased diaphragm surface area, enabling the "141" to respond sensitively to minute pressure changes.
2. Absolute lock-up at zero flow—guaranteed by a new stronger lever-controlled valve and a synthetic material of the measured hardness required for valve discs.
3. A protective cap guarding the spring adjustment screw from damage such as bending and breaking and thus making it possible to bury the regulator underground and pipe the vent above ground.



(This item supplements Rockwell Manufacturing Co. data on Pages 3669-3704 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E1** on Reader's Service Card, last page this issue.



Mark TA Gas Turbine

Clark Bros. Co. of Olean, New York, one of the Dresser Industries, has announced that it has completed an agreement with Ruston-Hornsby Ltd., Lincoln, England, for the manufacture and sale of the Ruston Mark TA Gas Turbine in this country. This unit develops 1130 BHP. The Mark TA is similar in design to the Clark Type 302, 8500 BHP gas turbine.

The new unit is well suited to stationary or portable power generation and to marine and industrial mechanical drives. Typical areas of use are gas and fluid transmission where the variable speed or high starting torque characteristics of a two-shaft turbine are required. It is equally well suited to processes where power is required and where the exhaust energy can also be used for pre-heating or for the generation of steam. Its light weight and small size permits use in locations where heavier units can not easily be used. Typical of these uses are barges, boats, trailers, second floors, etc.

The Mark TA Gas Turbine operates on a simple, open cycle. It is a dual shaft, series flow unit which develops 1130 BHP at 80° F. and 1000 feet. The nominal low pressure or output turbine speed is 6000 rpm. Output speeds of 1500 and 1800 rpm are available for driving 50 or 60 cycle generators. These speeds are obtained through the use of built-in planetary gears.

Temperature and altitude have the usual influence on the turbine rating. A 3.5 percent reduction of output is required for every 1000 foot increase in altitude; a 5 percent reduction or increase for every 10° F. above or below 80° F.

(This item supplements Clark Bros. Co., Inc., data on Pages 1290-1291 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E2** on Reader's Service Card, last page this issue.

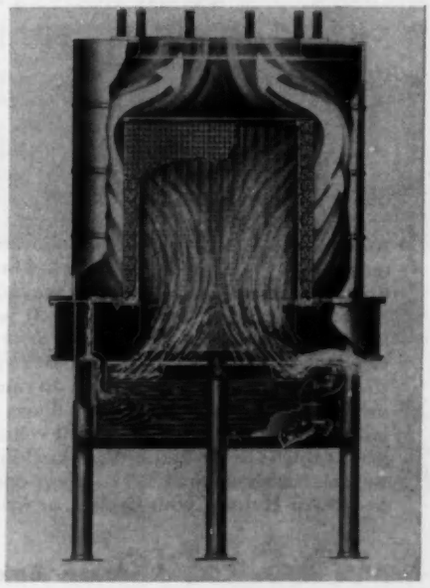
Oil Bath Air Filter

An oil bath air filter which combines high efficiency with extremely low pressure loss has been announced by Air-Maze Corporation. The new LPD achieves low-pressure-drop operation without any moving parts or any outside energy supply, resulting in economical oil bath filtration for use with a much broader range of compressors, blowers and engines.

The filter reduces energy requirements, making it possible to eliminate power-consuming motors and all other moving parts. This was accomplished by reversing conventional oil and air circuit.

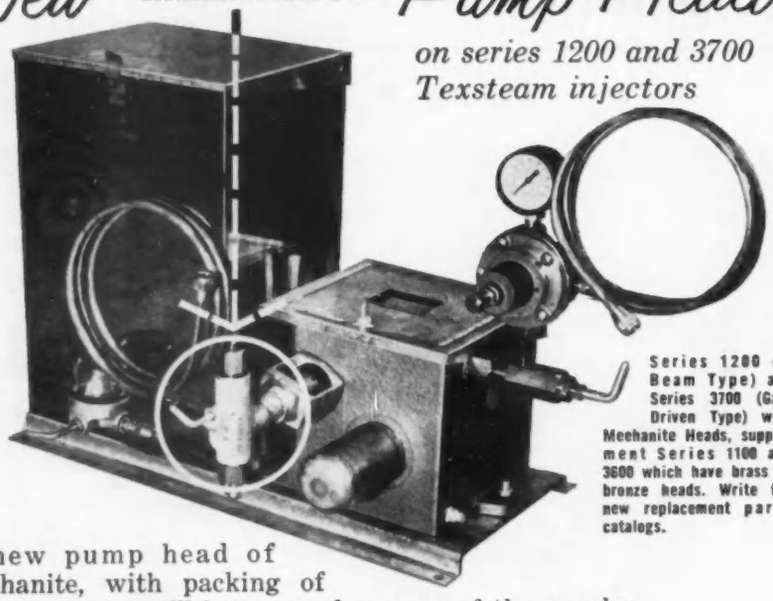
Smallest of four models recommended for variable speed engines and compressors has a capacity range from 800 CFM to 3500 CFM with a pressure drop of 0.6 inch water gage at the minimum and 4.8 inches at the maximum. Largest of the models for constant speed engines and compressors ranges in capacity from 16,500 CFM to 24,000 CFM with a pressure drop ranging from 1.9 inches to 3.5 inches.

For more data, circle **No. E3** on Reader's Service Card, last page this issue.



New MEEHANITE *Pump Head*

on series 1200 and 3700 Texsteam injectors



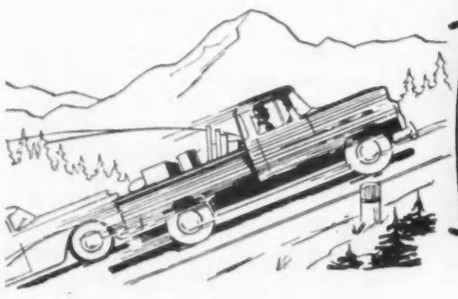
Series 1200 (S-Beam Type) and Series 3700 (Gas-Driven Type) with Meehanite Heads, supplement Series 1100 and 3600 which have brass or bronze heads. Write for new replacement parts catalogs.

A new pump head of Meehanite, with packing of Hycar, assures still better performance of the popular Texsteam Chemical Injectors.

The Meehanite head is a special iron casting, designed to withstand practically all compounds commonly used for emulsion breaking and corrosion injection service. It promises years of trouble-free duty.

TXT **TEXSTEAM CORPORATION**
DIVISION OF VAPOR HEATING CORP.
320 Hughes St., Houston, Texas

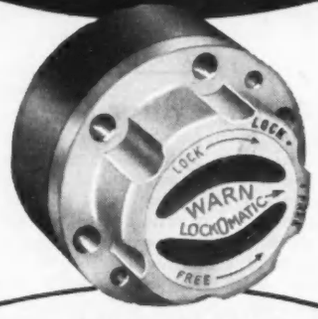
6308



GET MAXIMUM USE OF YOUR 4-WHEEL DRIVE!

SAVE ON EQUIPMENT... SAVE GAS, TIRES, REPAIRS

Warn Hubs on your 4-wheel drive make 2 vehicles out of 1, because you can use it as a light duty 2-wheel drive pickup, or 4-wheel drive work horse. Warn Hubs save gas, tires, repairs; stop front gear whine and shimmy in 2-wheel drive – and you have 4-wheel drive whenever needed. Automatically, too, with Warn Lock-o-matics! They select free-wheeling 2-wheel drive or tractive 4-wheel drive *as you shift!* When road conditions change, you just keep right on going *in whatever drive is required.* With Warn Hubs, whenever you use 2-wheel drive you're saving on operating costs – and because you have 4-wheel drive too, it's the only light vehicle you need! Lock-o-matic (and Locking) models for all makes 4 W. Ds. to 1½ tons. See Warn Hubs at your dealers, or write:



NEW WARN *LOCK-O-MATIC* HUBS

Give your 4-wheel drive automatic free-wheeling 2-wheel drive – and automatic 4-wheel drive forward and reverse

AS YOU SHIFT!

WARN MFG. CO., Riverton Box 6064-WO10, Seattle 88, Wash.

King 75 WP Swivel

King Oil Tool's new 75 WP Swivel is now being offered. It took almost four years of testing in laboratory and field and under every condition before being offered to the industry.

The new 75 WP Swivel is especially designed for drilling medium depth oil wells, for deep slim hole drilling and for the heavier workover rigs. It is efficiently economical and features an extremely high ratio of capacity to weight. The swivel is of alloy steel throughout, available with bail or elevator shank, has angular-contact type ball bearings, mounted to assure ample radial stability, wash pipe and stuffing box, automatic grease seals to retain bearing lubricant, stuffing box easily replaced, chevron or V-type packing.

The rugged field tests proved superior performance to 5000 feet with 4½-inch drill pipe and to 6000 feet with 3½-inch drill pipe—and the new 75 WP is more readily transported than other heavier swivels having comparable capacity.

(This item supplements King Oil Tools data on Pages 2784-2787 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E4** on Reader's Service Card, last page this issue.

Logger

Designed for core drilling, seismic exploration, shallow oil or gas production or water-flood operations, the Universal Logger, developed by Surface Surveys, Inc., is a compact, portable electrical logging instrument. Weighing approximately 100 pounds, small enough to fit into an automobile luggage compartment, and obtaining all its power from the 6 or 12 volt electrical system of the transporting vehicle, the logger can be taken easily to the most difficult locations.

Simplified set-up and logging proce-

SEE The United States Steel Hour. Televised alternate weeks. Consult your local newspaper for time and station.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.

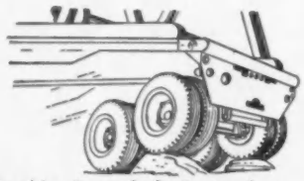
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

NATIONAL USS SEAMLESS

DRILL PIPE . . . CASING . . . TUBING

UNITED STATES STEEL

SMOOTH RIDES IN THE ROUGH



Double-pivot shaft in tandem keeps load in balance in rough areas, guarantees load equalization between axles, reduces wear on tires.

Exclusive hi-tensile, pressed-steel frame with angle truss brace permits heavier loads.

Look to Loadcraft for dependability in meeting your oil field transportation requirements. Since the first pole trailer was built 40 years ago by Fred Spencer, trailer manufacturers have attempted to duplicate Spencer quality. Pulls easier because of Spencer True-Beam Axle with machined-in camber, for correct toe-in, maximum tire life. Optional rolling tail pipe for rear loading has self-aligning roller bearings in each end. Find out for yourself that a Spencer Trailer is a quality trailer.

WRITE FOR LITERATURE

Choose from a complete line of Pole and Pipeline Trailers, as well as tandem or single-axle, semi-floats, or low-beds.

Spencer-Safford LOADCRAFT
AUGUSTA, KANSAS

BRIGHT PROSPECT FOR "PIPE DREAMS"

Drillers' "pipe dreams" are of rugged dependability. Producers' "pipe dreams" are of consistent high quality. Both are dreams of economy. And both could well be dreams of FBT seamless †casing, †tubing or †drill pipe whose in-the-field performance has won praise from qualified oil men. For outstanding service on outstanding tubular goods, contact Texcon for FBT.

**Finest Buy in Tubular Goods.*

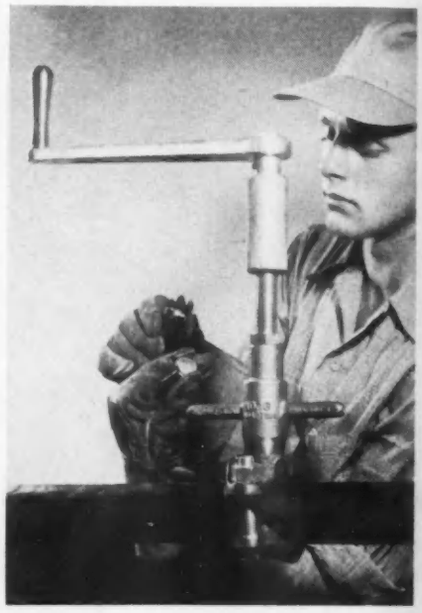
TEXAS CONTINENTAL TUBE COMPANY

Bank of Commerce Bldg. FBT Houston, Texas

dures make additional personnel unnecessary for the unit's application. Unitized construction reduces maintenance and service costs.

Features include a logging depth of 1500 feet; logging speed of 5 to 40 feet per minute; cable pull up to 100 pounds, automatic level-wind, automatic load control, reel release clutch and reel friction brake. The single channel recorder provides a permanent log of signals received on a four-inch strip chart. Three basic electrical measurements, DC millivolts, AC millivolts and resistance, are provided. The simple lead sonde provides either a self-potential or resistance log.

For more data, circle **No. E5** on Reader's Service Card, last page this issue.



Pressure Drilling Device

The M. B. Skinner Company (South Bend, Indiana) is putting out a drilling device for the gas industry that enables the user to drill gas mains under pressure. At the foot of this device is a small hollow mill trepanning cutting tool of special tool steel made by Allegheny Ludlum Steel Corporation. This steel, called type 609, is a shock resisting steel of the silico-manganese type and is used, in this instance, for cutting sections or plugs out of pipe.

The drilling device can operate on any gas main and does a workmanlike job on normal pressures currently used in gas distribution systems. It has been thoroughly field tested.

The tool is operated by one man; its set-up time is fast, it has a removable cutting bit which can be quickly changed to varying sizes; and it's easily transported. About 100 cuts per bit with type 609 is standard with an experienced operator before sharpening is necessary.

(This item supplements M. B. Skinner Co. data on Page 4620 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E6** on Reader's Service Card, last page this issue.

For HIGH pump pressures

specify AMERICAN IRON *Hydra-Cushion*

Slush Pump Valves & Seats

American Iron Hydra-Cushion Valves and Seats operate efficiently at **all** pressures because of the **hydraulic cushion action** of the mushroom on the valve seat and the cylindrical mud chamber of the valve. The trapped mud cushions the shock of the valve on the valve seat, preventing excessive pounding out of valve on seat under high pressure.

AMERICAN IRON & MACHINE WORKS CO. INC. — MANUFACTURERS OF OIL FIELD EQUIPMENT — OKLAHOMA CITY

SUBSIDIARY OF AMERICAN MACHINE & FOUNDRY COMPANY

Immediate Delivery!

NEW MODEL Series 53 CURTIN CENTRIFUGES

15 cc size

No. 3420-53

with **7** improvements

Aluminum castings reduce weight one-third to approximately 5-1/4 lbs. . . . Diameter of drive shaft increased from 7/16" to 1/2" for added strength . . . Gear train redesigned for more efficient operation . . . Both 15 cc and 100 cc sizes use the same crank . . . Spindle shaft ball bearing mounted, easier to turn . . . Drive shaft of corrosion resistant stainless steel . . . Spindle of corrosion resistant stainless steel.

Write for bulletin 53

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The New and Improved Amazing Attractometer

The latest and most modern method of geophysical exploration that shortens the route to petroleum reserves by rigid instrumental recordings, indicating the existence or not of hydrocarbon accumulations, and approximate depth. Ten locations for a major oil company without error. Surveys conducted for cash fee and chance to earn small override, oil payment, leases or other interest, where saturation is indicated in commercial quantities. Information on request.

To establish conclusive proof of the accuracy of our geophysical work, we will, without cost to you, test and record a log of your well on tape, bearing your signature and ours, of your rank wildcat location, in advance of drilling, indicating the existence or not of petroleum in commercial quantities underlying the tested areas and approximately at what depth it may be found. The instruments are entirely self-operating during testing period.

GEOPHYSICAL SURVEY SYNDICATE

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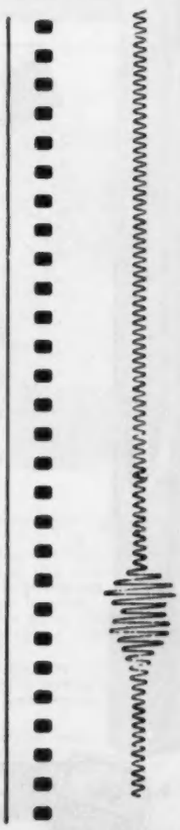
Sherman Oaks, Calif.
Phone STate 46903



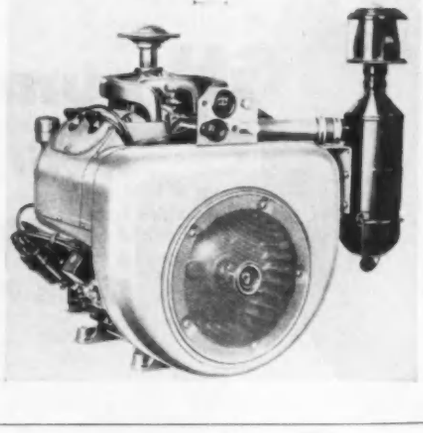
Specimen of log tape indicating saturation with break in zone

Air-Cooled Engine

A new model Wisconsin air-cooled engine was announced by Wisconsin Motor Corporation, Milwaukee. It is designated as the "Model VH4"—a 30 hp., 4-cylinder V-type engine designed to fill the gap which has existed between the 25 hp. Model VF4 and the 36 hp. Model VG4D.

The new engine is of basic High Torque design, traditional Wisconsin heavy-duty construction and operates at a maximum speed of 2800 rpm. It is a smooth-running, even-firing engine and can be adapted to operate on kerosene, natural gas, LP fuels or fuel oil of 38-42° Baume gravity and 35 octane rating.

Special equipment available for this engine includes hydraulic pump, visual-type



air pre-cleaner, rotating screen, automatic high temperature switch, electric generator and starter (or starter only), clutch assembly, reduction assembly or clutch-reduction assembly. The VH4 will be supplied as an "open engine" with or without side-mount fuel tank or as a completely housed power unit with either built-in or underslung fuel tank.

The Wisconsin Model VH4 will provide power for operating forage harvesters, combines, pickup balers, light tractors, construction and oil field equipment, maintenance-of-way equipment, material handling equipment, reefer refrigeration units and many other types of equipment requiring full power, heavy-duty stamina and the High Torque that successfully carries shock-loads without stalling.

(This item supplements Wisconsin Motor Corp. data on Page 5309 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E7** on Reader's Service Card, last page this issue.

Get more footage at lower cost with

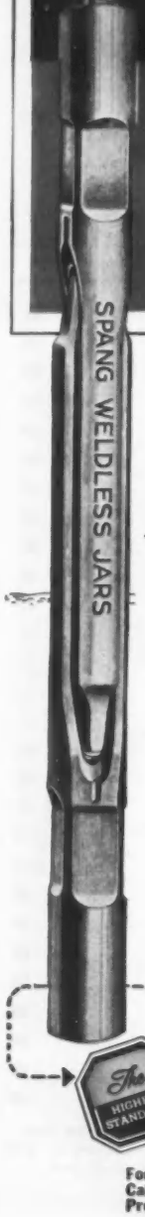
SPANG

ALLOY-STEEL

Weldless Jars

...forged from ONE PIECE of Alloy Steel

NO WELDS TO BREAK . . .



Each SPANG WELDLESS JAR is forged from a single piece of selected alloy steel and is scientifically heat-treated and tempered to obtain proper hardness and toughness in the rein sections for maximum strength and wear resistance in the most severe drilling service.

The joints, heat-treated and precision machined, are stronger and more durable, assuring fewer fishing jobs. Records over the years show up to four times more footage with SPANG Alloy-Steel WELDLESS JARS.

For further information on weldless jars, and for FREE CATALOG of other SPANG cable tools, contact your nearest Dealer or write direct to:

The HIGHER STANDARD

SPANG & COMPANY

DEPT. 0-6 BUTLER, PENNSYLVANIA

For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.

Water Fire Extinguisher

A new stored-pressure water fire extinguisher has been introduced by Ansul Chemical Company, Marinette, Wis. The extinguisher has a 2½-gallon capacity. Underwriters' Laboratories has classified the unit 2-A, the highest rating given to extinguishers of this capacity for use on Class A (wood, paper, rags, etc.) fires.

An important feature of the new unit is its shut-off control. The operator is able to turn off the water at will, thereby reducing water damage to a minimum and allowing most efficient use of the water contained in the unit. No bouncing or inverting is needed to activate the extinguisher. The stream of water is released by merely operating the squeeze grip carrying handle. The water stream, supplied by full capacity air pressure from start to finish, has a range of 35 to 40 feet.

After use, the extinguisher can be quickly recharged by replacing the water and pressurizing the unit to 100 pounds per square inch at any source of compressed air. A tri-color pressure gauge tells at a glance whether the air pressure is adequate to discharge the unit effectively.

When anti-freeze chemical is added, Ansul's new water fire extinguisher will operate properly in temperatures down to —40° F. It is available in three different shells—stainless steel, brass and chromium plated brass.

For more data, circle **No. E8** on Reader's Service Card, last page this issue.

DRILLING

Long-Life Tool Joint

Reed Roller Bit Company, Houston, is producing an improved hard metal application which adds to the O.D. life of Reed Tool joints. The advanced hard metal application, known as Inarclad (pronounced "inner clad"), welds the hard metal into the tool joint steel rather than binding the hard metal onto the surface of the tool joint. The process uses the high alloy steel of the tool joint itself as the binder for the hard metal to reduce the chance of the band spalling or flaking.

The Inarclad application of the hard metal is done by automatic electric welding machines utilizing an inert arc process. Using a non-consumable electrode, the electric arc melts the tool joint steel into a puddle at the proper spot. Hard metal grains are fed into the puddle automatically. The arc is shielded by a continuous flow of inert gas to prevent contamination or oxidation of the steel during the melting process.

Inarclad hard metal bands are applied to the tool joint without grooving and result in a slight surface build-up. This build-up equals approximately 1/32 of an inch. By applying Inarclad bands in this manner the O.D. of the tool joint remaining after all the hard metal is worn away is 1/16 of an inch larger than it would be had the same bands been laid in grooves.

Continuous spot checks of the amount of hard metal being applied are made by weighing the tool joint before and after the Inarclad application to assure that the prescribed amount of hard metal is present in each band.

(This item supplements Reed Roller Bit Co. data on Pages 4281-4352 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E9** on Reader's Service Card, last page this issue.

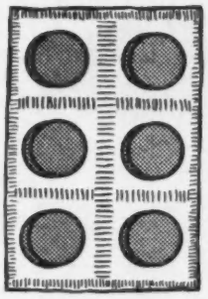
Governor Control System

An air-actuated governor control which eliminates throttle rods or mechanical linkage of any kind for multiple engine drives has been introduced by Stewart & Stevenson Services, Inc.

The new governor control system simplifies the synchronization of multiple engines and practically eliminates the possibility of an engine pulling more, or less, of its share of the load.

(This item supplements Stewart & Stevenson Services, Inc. data on Pages 4770-4775 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E10** on Reader's Service Card, last page this issue.



SIMPLEST, SAFEST WAY TO KEEP RADIATORS and ENTIRE COOLING SYSTEMS CLEAN

SAND-BANUM SPECIAL

6 Concentrated Tablets in each handy Cellophane Packet

Ounces Only Once a Week Remove and Prevent Boiler Scale and Corrosion

SAND-BANUM
Pure Colloidal Concentrate

SABCO
Rust Preventive Aluminum paint; 2 coats in one application.

RUSTEND
Clear Rust Arrestor—Rust Preventor

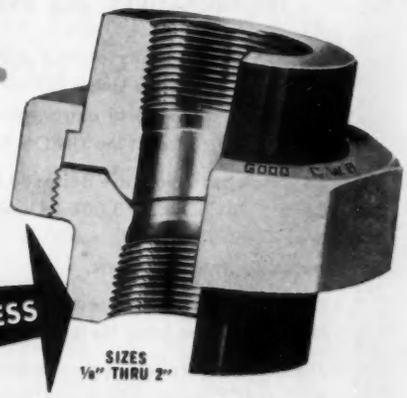
SABANOL
For clean and complete fuel oil burnability

Stocked by Leading Supply Houses
GULF COAST DISTRICT REPRESENTATIVES
Western Sand-Banum Company, 1717 Chenevert St., Houston, Texas

AMERICAN SAND-BANUM CO.
ESTABLISHED 1926
MEADOW BROOK NATIONAL BANK BUILDING
FREEPORT, NEW YORK

NEW petro 6000 LBS. C.W.P.

FORGED STEEL UNIONS
Ideal for High Pressures of Gases or Liquids, Hot Oils, High Temperatures, Ammonia Hot or Cold & Power Piping



HEAVIER WALL THICKNESS

SIZES 1/8" THRU 2"

- The wall thickness of this New Petro Union has been greatly increased to easily withstand the severe demands of higher pressures and hot or cold temperatures. It is drop forged from uniformly heated steel forging bars. Grain and fibre structure are refined through the controlled hammer impact on the hot, plastic metal as it is confined in the closed dies. The hot forging develops the tensile and torsional strength, the toughness and fatigue endurance required to enable the finished Union to resist the most complex stresses and strains ever present in high pressure and high temperature piping systems.
- Nuts are octagon in shape and are Udylited. The nut threads are rust-proof, spark-proof and permanently lubricated with Udylite Cadmium.
- The ends are also octagon in shape to provide flat gripping areas for wrenches.
- The ends are tapped, sharp and clean, per American Standard B 2-1 1945 (for tapered pipe threads).

THE "ECONOMY PLUS" UNION

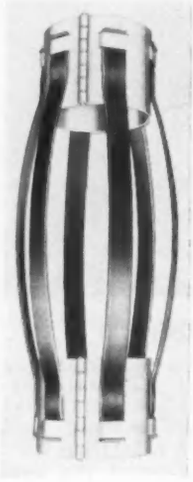
You'll get greater ruggedness, dependability and service with a minimum of downtime or maintenance time. Considering the original low cost it's the most economical Union you will ever buy.

MAIL THIS COUPON TODAY!
PLEASE SEND US COMPLETE INFORMATION ON THE 6000 LB. PETRO
NAME_____
ADDRESS_____ CITY_____ ZONE____ STATE_____
CLAYTON MARK & COMPANY • 1900 Dempster Street • Evanston, Illinois

More than a mere pipe fitting!
catawissa
PERFECT SEAL
unions
give a 3 to 1
safety factor
PLUS
A PERFECT SEAL!
THERE'S A CATAWISSA PERFECT SEAL UNION FOR EVERY USE . . . ALL TEMPERATURES, ALL PRESSURES!
The full dependability of HOT FORGED STEEL is yours in a Catawissa Union (hot forged from solid steel bars) with several extra value features that are exclusive here at the UNION SPECIALISTS!
All Catawissa Unions are designed to give a 3-to-1 SAFETY FACTOR . . . 3,000-lb. service unions are tested to 9,000-lbs., 6,000-lb. service unions tested to 18,000-lbs., etc.
Exclusive Ball-to-Angle seat design assures a PERFECT SEAL even when the pipe is not in alignment!
Machining operations assure a UNIFORMITY AND ACCURACY heretofore found only in special fittings and, with rigid inspection both during and after machining, guarantees LEAKPROOF CONSTRUCTION!
Satisfaction is guaranteed in any application—whether it be general low pressure service or extremely high pressures and temperatures (for air, oil, gas, chemicals, hot oils, gases or steam).
WRITE FOR CATALOG 11
AVAILABLE FROM LEADING INDUSTRIAL SUPPLY FIRMS
CATAWISSA VALVE & FITTINGS COMPANY
60 MILL STREET ★ CATAWISSA, PENNA.

PRODUCTION

Red Top Centralizers



Byron Jackson Tools, Inc.'s new line of Red Top Centralizers employ a new method of cage and spring attachment which causes the springs to be pre-stressed in assembly. The springs are put under tension and inserted into pockets in the cages which maintain the stress. This pre-stressing is counter to the force which is exerted upon the centralizer in the hole and thereby exerts the maximum centering force when in use.

The rivetless, weldless method of attaching springs and cages eliminates the uneven stress pattern created by riveting and the embrittlement caused by welding. Red Top springs float freely on the casing—always fulcrum on the centralizer cage, not on the casing.

(This item supplements Byron Jackson, Division of Borg-Warner Corporation, data on Pages 905-1068 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E11** on Reader's Service Card, last page this issue.

Water Shut-Off Service

A new service, Visqueez, for shutting off water encroachment in producing wells, is offered by the Chemical Process Company. Visqueez is an oil-cement slurry in which the oil has been especially treated prior to mixing so that the cement will be carried to the deepest possible penetration.

The slurry contains a low-fluid-loss carrying agent that will hold cement in suspension almost indefinitely, which reduces the possibility of screen-out to a minimum and assures maximum penetration of the slurry. The setting time of Visqueez also can be controlled, which insures against premature setting of the cement under any conditions. Any part of the slurry that enters an oil-bearing portion of the formation that does not contain water is recoverable as free-flowing oil and cement.

Other advantages of the new slurry are that either common or quick-set cement may be used, temperature and pressure have no effect on the efficiency of Visqueez, and the properties of the slurry are such that the usual high injection pressures are not required.

For more data, circle **No. E12** on Reader's Service Card, last page this issue.

Hot Oil Heater

Texsteam Corporation, has developed a new portable hot-oil heater called the Tex-Heater 25M for oil field production work. It is designed to heat 70 barrels of crude oil per hour, to speed up the process of treating oil in field storage tanks, to clean paraffin out of oil-well flow lines and to

heat oil for pumping under high pressure into oil well formations. It may also be used to blend heavy crudes with lighter oils in pipe line service and act as a pre-heater for heavy crude oil.

One of the outstanding features of the Texsteam hot-oil heater is the ability to burn most crude-oil fuel right from the well. This is accomplished by air-atomizing the crude-oil forced through a patented fuel nozzle. This is an important feature, it eliminates the costly work of hauling regular fuel to isolated oil fields. The unit is also being made to burn natural gas, propane and regular fuel oils.

After the unit has been started by turning on the manual fuel control the fire is automatically modulated from 1/10th to full-output by a specially designed temperature control that turns the fuel on and off and regulates the fuel released to the combustion chamber as needed to heat the oil to the pre-determined temperature setting. A constant ignition spark in the Inconel fire-pot insures proper lighting.

In addition to the oil-temperature limit control another safety feature can be easily furnished. This includes a CO_2 bottle with fittings designed to extinguish any internal fire and shut the unit off if a leak develops in the steel coil.

(This item supplements Texsteam Corporation data on Pages 4844-4849 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E13** on Reader's Service Card, last page this issue.

Displacement Slide Chart

A slide chart designed to provide a convenient reference for displacement data for 2-inch and 2½-inch Kobe Free Pumps has recently been released by Kobe, Inc. The chart shows displacement, in barrels per day, for each stroke rate between 20 spm and 83 spm for engine and pump ends of all 2-inch and 2½-inch free pumps.

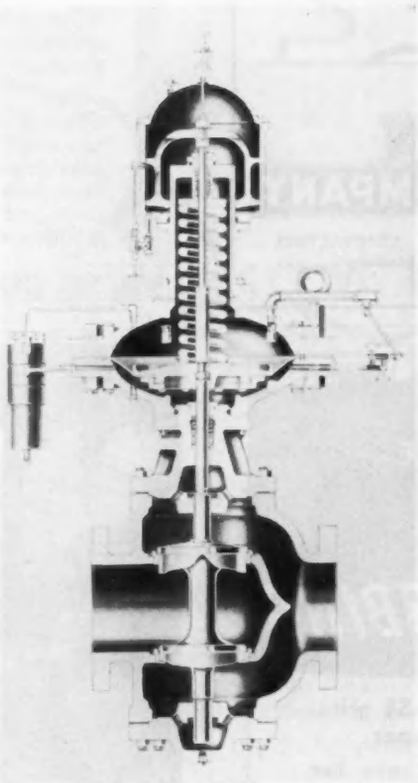
On the reverse side, the chart has a simple set of scales for determining the volumetric efficiency of both engine end and pump end of the free pump.

(This item supplements Kobe, Inc., data on pages 2809-2828 of the Composite Catalog, 21st Edition.)

For more data, circle **No. E14** on Reader's Service Card, last page this issue.

High Pressure Regulator

To solve the problem of vertical instability or jumping that is sometimes encountered on high pressure gas transmission lines, Fisher Governor Company has



designed and perfected a new high pressure regulator. Featured in the Series 883 and 885 regulators is an oil dash-pot which will dampen out any tendency of the valve to jump, yet will not cause valve to deviate from the control point.

Rugged throughout, diaphragm casings are capable of withstanding 1000 psi. Steel loading pilot is suitable for pressures up to 1000 psi and has an adjustable reduced pressure range of 100 to 450 psi. This new series is available in valve body sizes 2 inches through 12 inches.

(This item supplements Fisher Governor Company data on Pages 1706-1707 of The Composite Catalog, 21st Edition.)

For more data, circle **No. E15** on Reader's Service Card, last page this issue.

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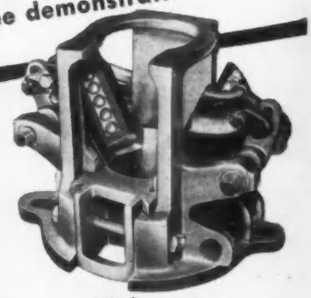

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